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THE MANURIAL SITUATION AND ITS DIFFICULTIES.*

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FIFTY years ago the manure industry was comparatively small and local. Its chief centre and market was in Britain. Before the Franco-German War of 1870 the only manure in which there was a really great overseas trade was guano. Since that date the manufacture of, and commerce in, fertilising materials have continuously extended at a rapid rate till in recent times the supply of manures has become a great world industry, employing an army of workers and an immense amount of capital in all the continents, and keeping busy a great navy of ships on all the seas.

Before 1870 the whole world's shipments of manures probably never reached a million tons in any one year. In 1912, on the other hand, there were produced over 6½ million tons of mineral phosphates alone, of which by far the greater part was shipped overseas from the United States, North Africa, and certain Pacific Islands, to Europe, Japan, Australia, etc. Of nitrate of soda in 1913 there was shipped from Chile 2¼ million tons, and in the same year Germany exported over 2 million tons of potash manures. In addition, smaller but still very large quantities of basic slag, sulphate of ammonia, superphosphates, bones, guanos, and other manures were shipped overseas as articles of international commerce.

Thus, the international fertiliser industry now involves annual shipments of many million tons, and the production and use throughout the world of a still greater amount of material.

* A paper read by Professor Hendrick at the Meeting of the British Association at Manchester in September.

The British fertiliser market, which was at one time the chief and, indeed, the only great market, is now a comparatively small item in the world's trade. The rapid growth of the German market, for instance, is shown by the following figures giving the total consumption of artificial manures in Germany in certain years :—

1890.	1900.	1910.	1912.
1,600,000	3,088,669	5,906,530	7,352,700 metric tons.

It is estimated that in 1912 German farmers paid about £30,000,000 for fertilisers.

It is more difficult to get complete figures for the United Kingdom, but there has been no similar increase in the consumption of fertilisers during the same period. For the past 30 to 40 years our consumption has been almost stationary in the case of certain leading manures like nitrate of soda and bones, while in other cases, such as superphosphate and basic slag, there has been a gradual, but not a very rapid, increase. The artificial manures used in the United Kingdom in 1907 were valued at a little under 15 million pounds.

The outbreak of war has naturally caused an extraordinary dislocation of an industry of such an international character as that of the supply of manures.

(1) It has stopped trade between belligerent countries, and has, therefore, cut off our supply of potash manures. Nearly the whole supply of potash manures for this and other countries was derived from the German potash mines. Only comparatively small supplies are derived from seaweed and other sources. Enemy countries will have plentiful supplies of potash manures, but the great export of such manures by Germany, even to neutral countries like America, has been almost entirely stopped.

(2) The war has put great difficulties in the way of oversea transport, and has caused a considerable rise in freights. It has, therefore, restricted the supply, or caused a great rise in the price, of all manurial materials which are imported from abroad. In the case of mineral phosphates the freights are now greater than the original cost of the material. Our supplies of nitrate of soda, bones and guanos, are all interfered with by the rise in freights, and the difficulty of getting shipment. On the other hand, the supply of such materials is largely cut off in the case of enemy countries.

(3) The withdrawal of men for military service has put difficulties in the way of the production of certain articles.

For example, the North African phosphate mines are hampered by the withdrawal of men first for the French and later for the Italian Army. In our own country the withdrawal of men and the restriction and increased cost of internal transport are adding to the difficulties of fertiliser manufacturers, *e.g.*, the supply of sulphuric acid necessary for the manufacture of dissolved manures is said to be restricted by the difficulty of getting the chemical plumbers required for the repair of acid chambers.

(4) The war has seriously interfered with international credit and exchange, and has thus in many ways, direct or indirect, hampered international trade in manurial materials, and in many cases caused serious delay in obtaining supplies. In recent times the German market has become a far more important market for many of the chief fertiliser materials than the British, and, when it was completely shut off from overseas exchange, serious interruptions and dislocations occurred which greatly affected British manufacturers.

We may next consider how all this will affect the supply of manures to the British farmer during the coming season, and how he is to meet the abnormal conditions in which he will be placed. It is most important that the agricultural production of the country should be not merely maintained, but increased in every possible way. Farmers should, therefore, (1) continue to use fertilisers in undiminished amount, so far as that is practically possible, (2) prevent waste of natural fertilising materials, and (3) make use of our home resources in fertilising materials as far as possible. This will involve some adjustments of their usual practices and routine, and it will be the duty of educational bodies and agricultural experts to give them all the advice and help they can as to how best to make such adjustments.

Of the four important kinds of manurial materials (nitrogenous, phosphatic, potassic, and calcareous), there is only one, the potassic, of which there will be a serious scarcity, and it seems almost certain that greater difficulty will arise from want of labour than from want of raw material. Several of the leading manure manufacturers in Scotland have been good enough to provide information on various points connected with the supply of manures for next season. The information so obtained has been of great assistance in drawing up the following statement. Probably what applies to Scotland will also apply in nearly every respect to the rest of the United Kingdom. The manufacturers who have been consulted are all

agreed that, except in the case of potash, the supply of raw material will not be the most serious difficulty, but that the want of labour will cause much greater trouble. This will be felt in the manufacturing departments, but will be even more serious in connection with carting and transport of materials. It is anticipated that the most serious difficulty will be not in manufacture but in distribution. It is, therefore, very important that farmers should not wait till spring to order their manures, but should spread their orders over as long a period as possible. In spring there is always congestion and some difficulty in supplying all customers promptly, and unless farmers get in a large part of their requirements early it will be impossible for the manufacturers to deliver the goods next season.

There should be no insuperable difficulty about this if farmers will give the matter a little attention and move in good time. With the exception of soluble nitrogenous manures, which may be washed away in the drainage, there is no loss when manures are applied early. Many farmers think that soluble phosphates are liable to be lost if applied in autumn or winter. This is not the case, as such phosphates are entirely fixed in the soil and suffer no loss in the drainage even when large quantities are applied. There are, no doubt, objections to farmers obtaining their manures early and storing them, but superphosphates, basic slag, bone meal and bone flour, can all be obtained early and applied at once, especially to grass land and corn crops. In the case of crops like turnips and potatoes, which are grown in drills, there is some advantage in placing the manure in the bottom of the drill, so that it may not be advisable to sow the manure early for these. In any case it will greatly help to relieve the situation if as much manure as possible is ordered early.

The scarcity of labour may also, to some extent, restrict supplies, though the danger here is not so serious. This is an additional reason, however, why consumers should order early. The man who leaves his order till the last moment will run a risk of finding that he cannot get supplies of certain articles at all.

Nitrogenous Manures.—It is probable that there will be sufficient supplies of nitrogenous manures. In normal times we export over three-fourths of our total production of sulphate of ammonia. Such export will now be restricted, as this and other fertilisers can only be exported under license. Our total production of sulphate of ammonia exceeds 400,000 tons per annum, so that there should be sufficient of this valuable

fertiliser available to meet even greatly increased consumption. It is probable that the price will be a little higher than in pre-war times owing to the enhanced price of sulphuric acid, and the increased cost of labour and transport, but it is not likely that the price will be excessive.

There should also be considerable supplies of nitrate of soda. Normally, the German market consumes many times as much of this substance as the British. The Belgians were also heavy consumers of nitrate. These great markets are now closed and practically unlimited supplies are nominally available for the British market. Freights from Chile have, however, risen to an almost prohibitive level. Therefore, though there is plenty of nitrate available in South America, it is probable that the price in this country will be high. At present the price of nitrogen per unit is much higher in nitrate of soda than in sulphate of ammonia. Great supplies of nitrate will of course, be required for the explosives industry.

In addition to these two leading nitrogenous manures there will also be supplies of others, such as calcium cyanamide and nitrate of lime. There seems no reason to suppose that the supplies of these will be seriously restricted. At present, calcium cyanamide (nitrolim) is considerably the cheapest of the concentrated nitrogenous manures per unit of nitrogen.

Phosphatic Manures.—It seems probable that manufacturers will be able to obtain sufficient quantities of raw phosphates, though at greatly enhanced prices. For a time after the outbreak of war there was serious difficulty in obtaining supplies, as contractors for these and other materials almost everywhere took steps to get their contracts cancelled. Further, as the German market was the principal one for high-grade Florida phosphates, many of the mines closed down when this market was cut off. To a large extent, the difficulties seem now to have been adjusted, but the price of rock phosphates will be considerably raised owing to the great rise in freights. Thus, before the war the freight from Florida was 15s. to 20s. per ton. It is now 50s. to 60s. per ton, and it is difficult to get bottoms even at these rates.

The cost of sulphuric acid will also be much increased owing to the rise in the price of pyrites, the increased cost of labour, and the great demand for acid for the manufacture of war materials. There seems also to be some uncertainty as to the supply of acid. The demand for Government purposes has not merely doubled or trebled, but has increased manifold, and it will continue to increase with the increased production

of munitions. Though active steps have been and are being taken to increase the supply of acid, and many manufacturers think there will be a sufficient supply, there are elements of doubt and uncertainty in the problem. It is not impossible that there may be a shortage for the manufacture of superphosphates and of other dissolved manures. If so, there will be a more or less serious scarcity of superphosphate. In any case the price of superphosphate will be greatly increased. If soluble phosphate is not scarce it will, at any rate, be dear.

On the other hand, there should be large supplies of basic slag available. As in the case of sulphate of ammonia, part of the basic slag produced in this country is normally exported. Such exportation is, at present, largely restricted, as it is forbidden except under license. Our recent production of basic slag has been a little over 400,000 tons per annum, while our production of superphosphate exceeds 800,000 tons per annum, of which about one-tenth is exported. There are normally available for home consumption about 750,000 tons of superphosphate in this country. The home consumption of basic slag on the other hand is about 250,000 tons per annum. These figures show that if there is a really serious deficiency of superphosphate it cannot be met by the use of slag. Even if we use at home the whole of the slag at present exported from this country, it cannot do more than replace a fraction of the superphosphate at present consumed.

Even if there is a serious deficiency of superphosphate owing to want of acid and labour, there is no reason why our soils should suffer from lack of phosphatic fertiliser so long as we can obtain supplies of raw mineral phosphates. Finely-ground Tunis and Algerian phosphates (and to these may be added Egyptian phosphates, which are now also on the market in bulk) are far more valuable as manures than is generally realised. They can be used for all the purposes for which basic slag is employed, and will give, weight for weight, of phosphoric acid, only a slightly inferior result. As they are cheaper per unit of phosphate, a greater weight of phosphate can be applied for the same money than in the case of slag, and still more than in the case of superphosphate. Even apart from war exigencies, ground mineral phosphates deserve far more attention for direct application as manure than they receive.

Potassic Manures.—As our chief supplies of potash manures are cut off, the most important question we have to consider is how we can maintain our crops without supplies of German potash salts. Various recommendations have been made as to obtaining potash from waste organic materials like hedge

clippings, bracken, and waste timber, bark, twigs, and similar forestry by-products. All of these are useful, and where it is practicable to obtain ash from such materials they should not be neglected. No large supplies, however, need be looked for from these sources. A more hopeful source of potash supply is to be found in seaweed. Even in peace time a certain amount of seaweed has always been burnt in Scotland and Ireland, and the ash, or kelp, sold to chemical manufacturers, who extract potash compounds and iodine from it. The production of kelp is a poor, badly-organised industry, found only among the crofters of the Islands and West Coasts of Scotland and Ireland. It is difficult to revive this decayed industry, but the writer believes that under present conditions greatly increased supplies of potash might profitably be obtained from seaweed.

Before leaving this subject it may, perhaps, be pointed out that the direct use of seaweed as manure is well worth the consideration of all farmers within reach of the coast. As potash has risen to about four times its pre-war price, seaweed is much more valuable per ton as manure than it was, and it is better worth while to incur some expenditure in saving and carting it to the land.

An immense amount of potash is at present lost in liquid manure. It is not generally realised that liquid manure is far richer in potash than in any other manurial constituent. As a result of 35 analyses of liquid manure* obtained from farms in the north-east of Scotland, the writer found that the percentage content of potash is, on the average, more than twice the percentage of nitrogen. There are, naturally, great variations in composition, and in exceptional cases the nitrogen was higher than the potash, but in nearly all cases the potash was higher than the nitrogen and generally very much higher.

Most of the potash in the food of stock is excreted in the urine, and the liquid which drains away from the dung heap is very rich in potash. If all the urine of stock, and all the liquid manure which drains away from dung heaps were saved and used as manure, it would largely do away with the necessity for the use of special potash manures, and would also supply much nitrogen to the soil. With potash at its present high price, the waste of liquid manure is almost criminal.

Liquid manure can be applied to the land in various ways. It may be soaked up in absorbent organic materials like peat moss, leaves, bracken, and other waste vegetable material, where such can be obtained, or it may be sprayed direct on the

* See this *Journal*, July, 1915, p. 346.

fields in the form of liquid. In any case it should be well distributed. Part of the prejudice which seems to exist against it in the minds of farmers appears to have been caused by its excessive use on limited areas easy of access. Farm-yard manure itself will do harm if applied in excess to limited portions of land, and no farmer thinks of applying it only to a few spots which he can get at easily.

Other methods which may be used to help the potash supply on certain soils are the use of soda salts, such as common salt, and nitrate of soda, and the use of lime. These manures are of use only on soils which naturally contain considerable supplies of potash locked up in insoluble forms. *

Calcareous Manures.—There is no danger of the supply of lime being cut off owing to the war, but there is a danger that owing to scarcity of labour and difficulties of transport supplies may not easily be obtained when they are wanted, especially if farmers do not order early and leave as large a margin of time as possible for obtaining delivery. In many districts of the country lime, whether in the form of carbonate or of burnt lime, is far too little used. In order to increase our crops during this time of stringency and high prices, greatly increased amounts of carbonate of lime and of burnt lime should be used over large parts of the country.

THE WORK OF EDUCATED WOMEN IN HORTICULTURE AND AGRICULTURE.*

MRS. ROLAND WILKINS.

(ii.) **SALARIED POSTS.**—For a woman who had had a training in gardening, the choice in posts before the outbreak of war was not very great. Commercial gardens did not afford openings to women workers to any extent, and, therefore, posts as gardeners were practically confined to those offered by private establishments or educational and other institutions. They can be divided into Head-Gardeners, Companion-Gardeners, Under-Gardeners or Improvers, Teachers of Gardening in Schools or Institutions, and Jobbing Assistants.

Head-Gardeners. — "Head-gardener," left unqualified, is an ambiguous term. It may mean the person who controls a big establishment with a considerable amount of glass, and a large number of under-gardeners; or it may be merely the person in charge of a smaller garden, with the help of a man or boy, and no glass beyond perhaps a vinery and a greenhouse for bedding plants and tomatoes. Some idea

* Continued from the *Journal* for September, 1915, p. 554.

of the relative numbers thus employed is given by the following figures. Out of 71 cases investigated :—

11	were single-handed.
38	had 1 or 2 assistants under them.
16	„ 3 or 4 „ „
6	„ 5 to 9 „ „

In 12 cases, one of the under-gardeners was a woman.

The following statistics have been compiled from records of nearly 100 cases of trained women holding posts as head gardeners :—

Length of College Training.

Less than 1 year	..	..	2 per cent.
1 to 2 years	..	..	21 „
2 „ 3 „	..	..	55 „
3 years	..	..	21 „

Salaries.

Receiving a weekly wage only	..	28 per cent.
Resident, or receiving board and lodging with a salary	..	55 „
Receiving a salary with furnished cottage or rooms, and often vegetables, fruit, coal and light	..	17 „

The highest salary received was £140,* the lowest was £52.

31 per cent.	received from	£52 to £70.
46	„	£70 „ £90.
2	„	£90 „ £100.
11	„	over £100.

The following table shows the wages received up to 1914 after a given number of years' experience, whether this was obtained as under-gardener, or in previous posts as head-gardener :—

<i>Length of Experience.</i>				<i>Average Salary.</i>	
Under 3 years' experience, average salary	..	..	£80†		
3 years' experience, average salary	..	..	75 5s.		
4 „ „ „	..	..	78		
7 „ „ „	..	..	78		
9 „ „ „	..	..	81 10s.		
10 „ „ „	..	..	87 10s.		
Over 10 years	..	..	90		

* In order to give the remuneration in equal terms, the value of board and lodging has been taken at £40 a year; and of lodging, with the other items named, at £20. These figures are only correct assuming that this represents the average amount which those receiving wages only would have to pay out of these wages for board and lodging. A separate compilation, made from those receiving weekly salaries only, gives the average amount per annum at £81, the highest being £130, and the lowest £52.

† This high figure is due to the large salaries received at once on finishing training in 1914 owing to the demand created by the war.

The figures bring out one point very clearly, viz., that the average salary received after 10 years' hard work and an expensive training is not such as to attract anybody to this profession on purely financial grounds; and that a love of the work and the desire for an open-air life must be the impelling motives. Other figures show the extraordinarily short time most girls seem to stay in their posts; 53 per cent. stayed one year or under; and only 10 per cent. stayed over 5 years. No explanation is given of this.

A very large amount of written evidence has been received from ladies employed as gardeners; it contains many results of experience and much useful criticism, which may well be summarised.

The Drawbacks to the Profession.—The salaries received are low compared with the expense of training, which cannot be much under £100 a year. They only afford a living wage to young, strong women, with no margin out of which to save for illness or old age.

The hours are long, usually 7 a.m. to 6 p.m., with half-an-hour for breakfast and an hour for lunch. There is often stoking and watering to be done.

The holidays are very short; perhaps a fortnight in the year.

There is a difficulty in obtaining posts for very young girls.

The loneliness of the life is very great. Employers are seldom seen, and there are only the other gardeners to talk to.

Causes of Failures.—The following are extracts taken from the evidence received under this heading:—

- "Too little responsibility when training."
- "Taking posts without due consideration of their suitability."
- "Through unwittingly undertaking too much."
- "Want of experience in direction of labour before undertaking a responsible post."
- "Not working long enough as under-gardener."
- "Too inexperienced when extra work was thrust on me owing to a reduced staff."
- "Taking a single-handed place when I had not got the physical strength for it."
- "Taking a head post when lacking in tact with men and deficient in organising power."
- "Ill health; delicate women should go as companion-gardeners where the hours are more optional."

A woman cannot compete with a man in strength, so that, to be as profitable to her employers, she must make up for it in being more methodical, enterprising and intelligent. She should learn how to do the heavy work so as to know how to

direct it, but should not undertake it herself unless the soil is very light. A woman saves where she does the pruning, sowing of seeds, potting, or undertakes work under glass. The work in stove houses, forcing work, etc., is very trying, and if a woman knows she cannot stand it she had better take a post where there is only the ordinary vinery and greenhouse for bedding plants and tomatoes. She should remember that a good training is of no use without experience; and that for posts in large places experience should include upkeep, routine work, labour and the general organisation of a large private establishment. The head-gardener is responsible not only for carrying out her employer's orders properly, but for tools, plants, hours of work of the men, and ordinary routine work. She must possess tact and strength, for she is (a) working head-gardener, (b) overseer, and (c) a woman.

Under-Gardeners and Improvers.—Before taking a place as head or single-handed gardener, a woman, even if she has spent one or two years at a training centre, would be well advised to gain wider experience by taking a post as under-gardener or improver, under a good head-gardener.

From the statistics collected it would appear, however, that more than half the women leaving college have gone straight into posts as head or single-handed gardeners.

This undesirable circumstance may be partly due to the fact that posts for women under-gardeners are very limited compared with the higher posts. This scarcity of lower posts is easily explained: employers who keep a small staff naturally prefer to have a man to do the heavy work since he can do such work quicker and better than most women, and for a lower wage. There is also a prejudice amongst men head-gardeners against having women under them; many do not care to give orders to a lady, and feel uncomfortable at having them always about; or it causes discontent among the other men. The housing question is also a difficulty; a man can lodge anywhere and his meals are no trouble, whereas a lady must have special arrangements made for her.

It may be as well at this point to answer the question so often raised: "Can women dig and do the heavier work of the garden?" The answer is "yes"; they do trenching, barrowing, mowing and watering as part of their training, and many think nothing of doing this work in their subsequent posts. Whether they should all do so is a different question. The average man would probably accomplish it quicker and better than the average woman, and at a lower cost. The general

opinion is that there is plenty of work to do in a garden which a woman can do as well as, or better than, the average gardener, and that it is uneconomical to give her labourer's work to do, even when she is willing and able to undertake it; in many cases a woman is not strong enough to do a great deal of it.

A compilation of the figures given as wages received by women as under-gardeners shows the following results:—

21 per cent. received board and lodging only.			
8	"	"	under £50.
44	"	"	from £50 to £70.
19	"	"	" £70 " £80.
8	"	"	" £80 " £90.

The highest amount received was £91, and this was a figure received since the outbreak of war; in fact the statistics show that salaries between £80 and £90 are war salaries, and that before August, 1914, no woman under-gardener received over £78. The lowest figure given, apart from those who received board and lodging only, was at Kew, where the salary some years ago was £26, rising to £42; 14 women taken on since the beginning of the war now receive 24s. a week, the sub-forewoman receiving 27s. They work on the same terms as the men, namely, 6 a.m. to 6 p.m. in summer, with three-quarters of an hour for breakfast and one hour for dinner; the women are now allowed half-an-hour for tea which they make themselves.

As under-gardening can only be looked upon as a continuance of training, women should endeavour to go only to places where there will be a prospect of gaining experience. As posts for women as under-gardeners are limited, a girl who is obliged to earn her living, or some part of it, immediately after training, is, however, often obliged to take any post which offers itself.

Companion-Gardeners.—There are a certain number of women occupying posts as "companion-gardeners." The hours are more optional, and gardening may be supplemented by household duties or secretarial work.

Jobbing Assistants.—Under this heading come those who work for jobbing gardeners; the only instances met with are of women employed by the few ladies who have jobbing businesses. The pay seemed to vary from £1 a week to 6s. a day, according to experience.

Teachers of Gardening.—The few big teaching institutions for women in horticulture have a few women on the staff, but mostly employ men-instructors and foremen. Most of the posts for teachers in gardening are at girls' schools and sundry

benevolent institutions, where the lady gardener combines supervision of the garden with teaching the girls or inmates.

The following rates of pay show that this type of work is generally better paid than that of the ordinary head-gardener :—

13 per cent.	received between	£70 and	£80.
22	"	"	£80 " £90.
30	"	"	£90 " £100.
35	"	"	Over £100.

The highest salary was £150; the lowest £70.

The greater number of these posts are residential. Some full-time non-residential posts were paid £80 to £100. A certain number received salary only, for part-time work; the nature of this and the amounts paid varied considerably. At one girls' school £78 was paid for 3 days a week, at another £28 for 5 or 6 classes a week. A county school for girls paid two guineas a lecture; a teacher for instructing the children at an elementary school received 5s. for the first hour and 3s. per hour afterwards; another, who taught London children for charitable organisations, received 10s. to 12s. a week for two days a week during term.

Apart from a knowledge of gardening, there appear to be certain qualifications necessary for the successful teaching of this subject to children and girls; given these, namely, a love of the work, an aptitude for teaching, and great patience and perseverance, the profession is stated to be a most suitable one for women and for which they are better fitted than men. The women are not here entering into competition with men; there is less manual work to do, a man being usually provided for this; it is a less lonely life for women than when they are employed in private gardens.

The general opinion is that more and more girls' schools are developing this side, and that there is a decided opening for properly qualified gardening teachers. At the same time women really suitable for it appear to be few; it is also stated that the training in the teaching side is important and too much neglected at present.

The various openings for women in horticulture have now been indicated. Stress has been laid on the disadvantages from a purely economic point of view in order to discourage those who do not realise the drawbacks. This is only one side of the question, however, and for those who have a real love of gardening and an outdoor life the advantages of horticulture as a profession, as compared with other professions, are very strong. A review of the general prospects in horticulture will be given, together with those in agriculture, in the general summary at the end of this report.

(2) AGRICULTURE.

THE term Agriculture is rightly or wrongly used in this report to embrace, in a general way, those subsidiary branches of the profession which are chiefly taken up by women and which are not technically actual farming. It will be advantageous to make this point clear at the outset, for vague and loose terms used in this connection cause a good deal of confusion in connection with the training of, and the openings for, women in agriculture.

By a "practical training in agriculture," do we mean a training which will enable women to run farms of their own, or take salaried posts as farm hands or farm bailiffs? Or do we merely mean such training as is necessary for workers in those branches of agriculture which are commonly associated with women's work on farms, and rather loosely included under the heading of agricultural work, viz., dairying and poultry keeping? As the training and openings in these branches differ in extent and character it is proposed to consider them under the following heads:—A, Farming; B, Dairy Work; C, Poultry Work.

The subjects of co-operative farming for women, and agricultural openings for women in the Colonies, will also be briefly alluded to.

A.—Farming.

(a) **Training.**—There is no institution for women corresponding to the agricultural colleges for men where a combination of practical and technical instruction can be obtained; neither are women admitted to the men's colleges. The nearest approach to such an institution is the Horticultural College at Studley, where an agricultural side has been added in recent years.

As regards the theoretical side, however, as taught in the various universities, the lectures are open to women as well as to men. Women have availed themselves of these opportunities in very few cases, and rarely take a degree course. The men attending these lectures have learnt the practical side on a farm, either at their own homes or as pupils. It has not been found easy for a woman to pursue this course unless she is of the farming class, and gets her practical knowledge at home. Either farmers are averse to taking women pupils, or parents do not care to let their young daughters go as pupils on a farm when they would not hesitate to send them to a collegiate institution.

Where, then, can practical instruction be obtained? When one examines the so-called agricultural training given at

various institutions the following facts are evident: (1) The training resolves itself solely into the teaching of butter and cheese-making, the care of poultry being occasionally added; (2) the agricultural instruction is purely lecture work; (3) the farm attached to the institution is used for demonstration purposes only, and, beyond milking, women take no part in technical operations. There is an indication however, since the outbreak of war, that several of the institutions are realising the need of practical instruction for women. For instance, the Midland Agricultural and Dairy College, at Kingston, Derby, which up till now has provided only systematic courses in dairying and poultry-keeping, has decided (if sufficient entries are obtained) to provide a special course in agriculture which will include instruction in field operations. The fee for a year's course will be £30, board and lodging amounting to another 13s. 6d. per week.

Studley Horticultural College, and, on a smaller scale, Greenaway Court, Hollingbourne, provide instruction in practical agriculture at the fees given in the Horticultural Training Table.

There are also ladies running farms, some of them on a considerable scale, who take pupils at a cost of from 2 to 2½ guineas per week inclusive. A list of these places with terms, etc., is given in a leaflet on training issued by the Women's Farm and Garden Union.*

(b) *Openings in Agriculture.*—If we considered solely what women had done in agriculture as a result of training we should find ourselves practically confined to their work in poultry-keeping and dairying. In horticulture women have set up commercial gardens as an outcome of their training, but as training in agriculture is practically non-existent, we find that the women who are farming, and there were 20,000 of them in the last census, belong, with few exceptions, to the farming class, and have been brought up to the work, or brought into it by marrying farmers. Amongst the more well-to-do their education and mode of life are of the same standard as those of other professional classes. In horticulture no established race of women gardeners of a higher class existed until recent years, and the women who received a training and subsequently set up commercial gardens were pioneers in the movement. It is more difficult, therefore, in collecting statistics and information as to the work of women in agriculture to confine oneself entirely to the experiences

* "Hints on Training for Women in Agriculture and Horticulture," post free, 7½d. Women's Farm and Garden Union, Queen Anne's Chambers, Westminster, London, S.W.

of women, who, without the previous knowledge gained in home training, have taken to farming as a profession. The lady farmers come across during the investigation have, in the majority of cases, turned out to be of farming stock, or to have been intimately connected with agriculture all their lives, either as daughters of country clergymen or of small landowners. To consider the question in the light of their experiences would merely end in a discussion as to whether farming pays or not, which in agricultural circles resolves itself into a question of individual capacity, whether of man or woman.

The question it is desired to answer is: What prospect is there for an educated woman, if trained in agricultural work, to earn her living or supplement a small income, whether by running a farm or taking some form of salaried post? The result of the investigations is to show that there do exist a few women who, without previous training (or even knowledge), have taken to farming for the sake of an outdoor life, and who manage to supplement small incomes; no case, however, has been found where an entire living is being earned.

Such women, however, are not sufficient in number to enable one to give definite and reliable statistics as to the possibilities for other women. They have started farming because they had an aptitude and liking for the work, or because they wished to live an outdoor life, and were of the exceptional type who would make a success of anything. All that can be done is to give instances of the most typical cases, to indicate results which have actually been achieved. As the question is being examined from the point of view of a possible profession for women with very small incomes or little available capital, no undertakings will be considered which involve above £1,000 outlay. This excludes all farms above 100 acres. The women who are farming on a larger scale than this have had business capacity, and a good stockman or competent working bailiff to guide them at the start in technical matters; in a few years an intelligent woman learns a good deal in this way, and gains experience as she goes along.

Farming on a small scale is rather different. Unlike the business head of a big concern who is concerned chiefly with administrative duties, a small farmer must do a large proportion of the practical work, and should possess a correspondingly greater capacity for, and a knowledge of, actual technical operations. Moreover, mismanagement, combined with a few bad seasons in succession, could easily cause the loss of the whole capital. Broadly, there are two types of small holdings, according to whether the horticultural

or the agricultural side predominates, and as they often merge one into the other it is proposed, as stated in Part I, to include under this heading small holdings of a gardening type, kept by persons who have received a horticultural training.

There are, first, the purely agricultural holdings (small farms of from 25 to 100 acres) and, secondly, holdings of from 3 to 20 acres, entirely under garden and fruit cultivation, with the addition of poultry and bees. Between these there range holdings on which several types of work are undertaken; it may be that gardening and fruit growing have been added to an essentially agricultural holding, or that cows and pigs have been added by degrees to what was originally started as a garden enterprise, and a certain amount of the land has been given over to produce food for the live stock.

Small Farms.—Small arable holdings are not very suitable for women; the work is hard enough for a man whose standard of living is lower, and who can do most of the work himself while his wife keeps house. A woman would have to farm on a scale large enough to allow for the employment of a man, and this would involve also relatively more capital than a grass holding of the same size.

On the other hand, there is not much on a grass holding that a woman cannot manage with occasional help. Hay-making and any small amount of arable cultivation can be done by contract. Since the outbreak of war, however, many women who had been in the habit of managing in this way have not been able to get labour for harvest work, though they have found that, once the crops were cut for them, they could do the carting and stacking without help.

Small Mixed Holdings.—It appears to the writer that small mixed holdings of the gardening type are more suitable for two women working together than those that are exclusively agricultural or horticultural. The reasons are as follows:—

- (1) The initial capital outlay is relatively less compared with the returns;
- (2) It is more possible to increase gradually the area under cultivation and add to the head of stock without much additional outlay in cash;
- (3) The risk is not so great where a large amount of capital has not been sunk, as there is less dependence on one class of produce, and a bad season has not such a completely crippling effect;
- (4) It is possible to carry on this type of holding in more remote places than is the case with, say, a highly developed type of market garden, and for this reason the land and cost of additional labour are proportionately cheaper.

There are, of course, many pitfalls to be avoided. One holding of this type was barely paying its way after 3 or 4 years

because questions of soil, climate, and nearness to market had not been thoroughly considered beforehand. The soil was too cold and heavy both for successful poultry-rearing and for producing early crops; the farm was in a district where successful local marketing depended on the earliness of the produce; and the distance from railway facilities prevented the profitable use of distant markets. On the other hand, one of the most successful holdings met with was equally remote from markets, with a poor soil, but the soil was easily worked in all seasons, and labour cost less; at the same time it was drier, and, therefore, more suitable for poultry, while a profitable system of purchase by local dealers, and a good carrier service compensated for the distance from markets.

In the following examples, No. 1 is that of a farm on which corn growing is combined with dairying, on a large enough scale to employ a man all the year round; No. 2 is a dairy holding combined with a market garden; No. 3 began as a poultry farm and market garden, and has grown by degrees to comprise a little dairy holding as well; No. 4 was started as a market garden, and now includes poultry, pigs, and goats.

(1) Miss G. and her friend have a farm of 65 acres in a corn-growing district of the Eastern Counties. They bought the land and buildings 4 years ago in a very neglected condition, and are slowly getting the land into better order. At the time of a visit they had three fields of autumn-sown wheat, a clover field and 5 pasture fields. Oats had just been sown, a mixture of tares and black oats was then being sown, and one piece of ground was being prepared for roots. The stock consisted of 7 Jersey cows, a Jersey bull, 3 heifers, 4 calves, 3 light horses, 1 pony, 1 heavy cross-bred mare, and a few fowls, but no pigs. They had kept a good number of bees, but these were now suffering from the Isle of Wight disease. The butter is sold to private customers and the corn marketed. The two women work themselves, and employ a man and a girl assistant. Neither of the women had received any special training, and both had come from London. Miss G., however, is very strong, and had a little experience on a home farm before starting farming herself.

They started gradually on capital which came out of the savings of a very small income; this they invested profitably in stock and implements, and increased its value by their own hard work. They consider that, at the present rate of progress, the farm will very soon be supporting them.

(2) Miss W. has a holding of 27 acres two miles from a residential town in a western county. About 4 acres are under ordinary market-garden crops, and the rest under grass in three fields. She keeps 6 cows, a pony, 5 breeding sows and about 60 head of barn-door fowls. She has a retail milk business, and also supplies greengrocers' shops in the neighbouring town. She takes the vegetable produce out herself in a car, and employs a boy to drive the milk cart. Further labour is supplied by a cowman and one old man, and the occasional

employment of a woman. Miss W. considered that if women had business heads and worked themselves there was no reason why they could not make a living, but had a poor opinion of those of whom she had had experience. She had had no particular training, but had been brought up at a country parsonage and had always been used to animals and country life.

(3) Two sisters have a small holding of 9 acres which they started 5 years ago on a capital of £50, their rent and living being provided for them. They invested this £50 entirely in poultry, buying two pens (one of which was of exhibition birds) and the necessary appliances. Out of this they practically built up their present stock of poultry, increasing their hatching each year up to 1,200 chicks. In addition, and entirely out of the proceeds of the initial £50, one goat was purchased and three reared, these having since been replaced by two cows. Butter is made and sold privately in the neighbourhood, and as people are now beginning to come to the sisters for milk, a third cow has recently been acquired. Two bull calves are bought in the market at a few days old to utilise the separated milk, and are kept till 7 or 8 weeks old, when they are marketed and two fresh ones are bought. The chickens are sold to the local poulterers and private customers and the eggs to an egg-collecting depot. Of the 9 acres, 8 are under grass in three fields, one of 4 acres being let off to be acquired when needed for young stock. One acre is under garden cultivation, being planted with apples, plums, cherries and bush fruit. Vegetables are grown rather than flowers as there is a better sale for them locally. The bush fruit is bought by a local jam factory; surplus vegetables are sent to a shop in the village, and the local grocers take all the tomatoes. The two ladies do practically all the work themselves. They had lived in a town until they started on the holding and, beyond keeping a few hens in a garden for the egg supply of the house, had had no training. One has since taken her first class certificate for butter-making at a county council dairy class, and the other spent three weeks on a poultry farm and has taught herself to milk first the goats and then the cows. What they did not know they have learnt from books and from experience and observation.

They were of opinion that if they had lived in a cottage at a low rent on their present holding, and not in a small, highly-rented house, they might be able to earn their living entirely from their work. The work, however, is very hard, and they did not think many women would stick to it as they had done.

(4) "A" has a holding of 23 acres attached to a small farmhouse. She sub-lets 12 acres, and has about 4 or 5 acres of grass land; the remainder is cultivated as a market garden and used for poultry runs. She keeps 10 goats, 300 to 400 head of poultry, breeding-sows and pigs, a pony, and 12 hives of bees. Of the garden land about 2 acres have been newly planted with apples, raspberries, and black currants, with potatoes and bulbs between the rows. Potatoes and vegetables are grown on the wired-in patches, which are used in alternate years as fowl runs, and in the original garden of the farmhouse. There is one cold-house and a good many frames. The goats' milk, and the butter made from it, are consumed in the house. Otherwise, except for some private London customers, all the produce is sold retail, chiefly to boarding houses in a neighbouring holiday resort; for this purpose a van and pony are kept and a lady is employed to drive it; the same lady has also charge of the goats. The produce sold in this way consists

of vegetables, fruit, jam, cut flowers, eggs, chickens, honey and beeswax. One man is employed regularly to do the heavy work, and, besides the lady who drives the van, two other ladies attend to the poultry and garden with the help of "A" and a friend.

This holding was started 8 years ago by renting the house with 5 acres of land at £30. "A" had £300 capital, out of which she had to live and supply equipment. She went on developing every year, and finding she could not do this and plant fruit satisfactorily under her lease, she finally bought the 23 acres, partly by means of gifts and partly by means of a loan on which she pays interest—sub-letting about half of the land until she is in a position to cultivate it all.

It is interesting to note that, while poultry was the means of building up holding No. 3, "A" is of opinion that poultry is less profitable than the other branches of her work. She considered bees very profitable—until they got the Isle of Wight disease—and last year sold 400 lb. of honey. There was relatively far less work with them for the same amount of profit, than in the other branches.

Another point is that she is in a remote spot 6 miles from a station or town of any size, and that the soil is poor and sandy. In spite of these drawbacks she is able to make the place pay, and, beyond taking in pupils who want light work on account of health, has no other source of income.

As regards previous knowledge "A" had had a short training at two horticultural centres, and had held gardening posts for some years subsequently before starting on her own account; the women she employed had also received previous training.

Salaried Posts in Farming.—Until the outbreak of war posts of this type hardly existed. Investigation has revealed only two women farm-bailiffs, if we exclude a certain number who supervise home farms as a family arrangement. Lady farmers occasionally employ other women to look after stock and help generally. Since the outbreak of war some have obtained posts as cow-women at 18s. a week and a cottage, milk and coal. Their duties are to milk the cows, drive the milk cart, feed the cows and calves, and fill up their time doing odd jobs. It is not likely that under normal conditions these women would contemplate taking posts of this nature except for the purpose of gaining experience before setting up for themselves.

B.—Dairy Work.

(a) *Training.*—The training of women in dairy work is the only branch of agricultural education which has been systematically carried out on public lines. Most of the county councils provide fixed or travelling courses of instruction either in butter or cheese-making, or in both. Some include teaching in calf-rearing, and the treatment of milk, and most of them comprise lectures on this subject and on the selection and feeding of dairy cattle. Anyone resident in such counties can obtain, either free or at a

Institution.	Cost of Tuition.	Cost of Board and Lodging.	Length of Courses.	Length of Terms.	Housing Arrangements.
University College, Reading.	£24 per session of 3 terms. £30 for 1 year's Certificate course. £16 for 6 months' course £10 for 3 months' course	£32 to £42 per session.	Diploma, 2 years Certificate, 1 year 6 months' course 3 months' course	Session = 3 terms of 10 weeks.	3 hostels for women students.
Lancashire County Council Farm, Hutton.	£10 a term £30 per session 10s. to 15s. a week	12s. 6d. a week.	Junior Dairy course, 9 weeks. Advanced Dairy course, 14 weeks. Diploma Dairy course, 40 weeks.	2 terms of 13 weeks 1 term of 14 weeks.	Live in college.
Midland Agricultural and Dairy College, Kingstons, Derby.	15s. to £1 a week £12 for 12 weeks £21 for 24 " £27 for 36 "	12s. a week.	(1) Short course, 5-6 weeks. (2) Dairy Factory Managers' course, not less than 9 months. (3) Dairy Teachers' course, not less than 9 months.	Agricultural session = 3 terms of 10 weeks. Courses (2) and (3) = 2 terms, October to December, January to July.	Live in college.
East Anglian Institute of Agriculture, Chelmsford.	£1 a week £10 for 12 weeks 15s. a week for a second 12 weeks, 10s. a week for the rest of the year.	15s. a week.	6 courses of from 4 to 15 weeks.	Open all the year round except 4 weeks in summer, 2 weeks at Christmas and 2 weeks at Easter.	Dairy hostel.

nominal expense, sufficient teaching in a few weeks to learn the rudiments of dairy work. For those wishing to pursue a longer course there are larger centres where a thorough training in all branches can be obtained at reasonable fees, and for which scholarships are obtainable. The object of these centres is chiefly to improve the knowledge of farmers' daughters in farm domestic economy, and preference is generally given to those who are intimately connected with the farming profession. Other students, however, can also attend at higher fees; a table is annexed (p. 629) giving the cost to such students of the dairy courses at the principal centres.

Instruction in dairy work can also be obtained at a number of small private places, and it forms an additional subject at some of the horticultural institutions already mentioned.

Length of Training.—Reference to the accompanying table will show that the diploma courses last for from 1 to 2 years; the short courses of from 4 to 6 weeks only deal with butter-making and the manufacture of cream cheeses; the short cheese-making courses are from 3 to 9 months in length.

In deciding what length of training is required a girl must consider it in connection with her future career. An intelligent girl can easily learn in a few weeks how to make butter and cream cheeses, and the points connected with the initial handling of the milk and cream for this purpose; but cheese-making proper is a scientific art which requires much longer training and experience, and the average learner cannot expect to learn much in a two-year course; a really sound knowledge of the various kinds of cheese made under varying conditions, such as is required for teaching purposes, could not be acquired without many years' further experience. If, therefore, a girl is merely going to take a post as dairy worker in a private establishment where only butter and cream cheeses are made, or wants to know enough to do the same work on a small holding, a few months' training should be ample; but if it is her intention to teach, or to secure a post as manageress in a factory, or as cheese-maker on a commercial farm, two years' training is essential, and many years' further experience under varying conditions is desirable.

Cost of Training.—The cost of taking the Diploma Course at the county council centres and at University College, Reading, is from £50 to £66 for a session of from 30 to 40 weeks. Tuition, only, varies from 10s. to £1 a week, according to the length of the course, and board and lodging comes to from 12s. to £1 a week. The details are set out in the table on p. 629.

(b) *Openings in Dairy Work.*—For women who have been trained in dairy work, and who do not return to their own homes, the openings in this country are practically confined to salaried posts, as dairy maids, teachers, managers or assistants. A woman with capital who wishes to start an enterprise of her own has the choice of three openings: (1) dairy farming; (2) cheese factories where the milk is bought from neighbouring farms and converted into cheese; and (3) retail dairies. The last-named branch of dairying hardly enters into present considerations, as it concerns distribution rather than production; but one or two successful enterprises were found in which a retail shop in a provincial town was run in connection with a dairy farm and appeared to pay well. Poultry, fruit, vegetables, butter, cream, and soft cheeses were sold as well as milk. There is always a demand in small country towns for first-class dairy produce, and it is these rather than the larger towns in which it is often difficult to get good butter and milk. An enterprise of this kind, however, demands business capacity and organising power, as well as a knowledge of the farming side, while a good deal of capital is involved.

Cheese Factories.—These hardly come within the scope of this enquiry, as they do not involve an outdoor life. There are one or two cases of women running cheese factories successfully after some years of dairy training and experience, and these women are of opinion that the industry can be made to pay. They buy milk from neighbouring farmers and turn it into cheese.

Miss X buys 400 gal. daily for 10 months and employs 3 girl assistants and 1 boy, superintending the business and doing part of the work herself. The farmers take back a percentage of the whey, the remainder being used for pig-feeding, about 20 pigs being kept at the dairy. Her annual turnover amounts to £2,000. The work is hard and continuous, involving Sundays as well as week-days. The dairy closes for 6 to 8 weeks in the winter when the farmers are rearing calves and milk is hard to get.

Small Dairy Holdings.—The writer has not come across many women who have set up for themselves on holdings of an exclusively dairy type. The larger dairy farms, over 100 acres in extent, which do not come within the scope of this enquiry, sent milk up to London or made cheese. Women who worked smaller holdings held the opinion that they could not provide for the wages of a man employed regularly and live on the profit from the holding, but that if they had sufficient experience in farming to enable them to run the holding with occasional assistance it might be possible for them to make a living with the help of women assistants or dairy pupils.

One case visited was that of a lady on a small farm of 22 acres in a southern county, some miles from a town, but in a residential district. The land was all under grass except for $\frac{1}{2}$ acre of potatoes; rye had been grown on this and cut green for the cows. The stock consisted of 6 cows, calves, 2 ponies, and a few poultry. A man at 15s. a week was usually employed, but all the work is now being done by the lady herself, an assistant and a pupil. A milk round had been worked up, and milk is sold at 4d. a quart and butter at 1s. 6d. per lb., while cream and soft cheeses are also sold. The workers deliver the milk personally with the aid of the ponies.

The place was started on a capital of £400, out of which the house had to be furnished, the stock bought and a living provided. The lady had been trained in dairy work only, and had held teaching and private posts before setting up for herself. She did not consider it at all easy to make a living on her type of holding, and thought that with bad seasons, or any strokes of ill luck there was liability to lose all her capital.

Salaried Posts in Dairy Work.—When considering the question of training it was observed that the largest number of women passing through the county council centres of instruction belonged to the farming class. Their after-career, therefore, would not enter into the scope of this enquiry were it not that the posts they take are identical with those open to girls of other professional classes after training. For this reason no distinction has been made between them in collecting statistics as to rates of pay, conditions of living, and numbers of available posts, etc.

The women who take situations after training can be divided into three classes.

Firstly, and these do not concern us, there are those who go into private households as dairymaids, and who often do domestic work in addition. Their wages vary from £18 to £28 per annum according to age and experience, and they live with the other servants.

Secondly, the better-class farmer's daughter, who, having to "go out," goes to a gentleman's dairy where a cottage is found, or to another good farm where she acts as dairymaid (generally as cheese-maker). In the former case the pay is about 20s. to 25s. a week, with cottage, coals, milk and butter; in the latter she lives with the family, receives laundry free, and is paid from £25 to £30 per annum. In some cases where the woman is a particularly good cheese-maker she might get up to £40 per annum.

Thirdly, and it is with this class that we are chiefly concerned, there are the girls of the professional class. In most cases they become teachers; in order to get the necessary experience, they usually go to a good farm, giving their services in return for the experience, or receiving 4s. to 5s. per week; or they obtain a situation as manageress in an institution, where

rooms are provided for them, or in a corporation dairy where they would lodge out.

Teaching Posts.—These posts require long experience in practical work of a varied nature ; there is much hard work in the early stages, and women must be prepared to turn their hand to anything ; they must also have received a sound, though not necessarily an advanced, scientific education.

The posts are few, and are hard to secure by the younger women ; they are for the most part held at county council centres, some ladies' colleges, and a few private institutions.

The County Council posts appear at first sight to be the best paid, but the actual figures are often misleading, as in many cases the instructress is paid by the week for six to eight months only, and during the rest of the year she must keep herself, as temporary employment is hard to get in the winter months.

From the figures received it would appear that the average salary for instructresses of all kinds amounts to £125. The lowest given was £70 and the highest £200 ; for assistant instructresses the amount varied from £52 to £140. The work is often hard and the hours are long. The work may begin at 6 a.m., and include Sundays, and there are no half-days off.

Manageresses of Commercial Dairies and Factories.—These posts also require long experience in practical work. In one case the milk of 100 cows was bought daily and turned into Cheddar and Stilton cheeses, butter and cream cheese. The separating and churning were done by electricity ; there was a boy to do the rough work and pupils to help. In another case, the manageress of a municipal milk depot had to buy 700 gal. of milk daily and distribute it to hospitals and child-feeding centres, while a large quantity was "reconstructed" for infant feeding. The salaries in this branch varied from £70 to £150, the average being about £90.

C.—Poultry Work.

(a) *Training.*—The training in poultry-keeping is at present very inadequate ; there is no standardised national examination for diplomas such as the National Dairy Diploma, or the Diploma in Horticulture awarded by the Royal Horticultural Society. Nine only of the county councils have fixed centres where poultry-keeping forms a recognised course, although others may hold lectures and give demonstrations on the subject. Moreover, of these nine, Hutton alone has the stock and equipment on a scale sufficient for those who require a complete course of study.

This subject is also taught at the Horticultural Colleges of Swanley and Studley, and at many of the private gardening institutions given in the table on p. 561. There are also innumerable commercial enterprises in connection with which a small number of pupils are taken, for in this industry, as well as in others, pupils are one of the sources of profit.

There does not appear to be any centre where women can be adequately trained as poultry instructors; this fact is pointed out in the report of the Committee which recently enquired into the Agricultural Education of Women, and the establishment of such a centre, and the institution of a National Poultry Examination with a Diploma, form two of their recommendations.

The length of the courses, and the cost of tuition at the Lancashire Farm School at Hutton, and at the Midland Dairy Institute are given below. For non-contributing counties they are:—

<i>Hutton.</i>		
<i>Fees.</i>	<i>Length of Course.</i>	<i>Length of Term.</i>
Tuition, £10 a term or £30 a session, or 10s. to 15s. a week.	Junior, 9 weeks ... } Advanced, 14 weeks } Diploma, 40 weeks.. }	Session. 40 weeks.
Board and lodging, 12s. 6d. a week.		

<i>Midland.</i>		
Tuition, £1 a week .. } Board and lodging, 12s. } a week }	12 weeks, beginning in March.	

The fees for students from contributing counties are:—

<i>Hutton.</i>	
Board, lodging and tuition, £7 per term, or £21 per session, or 15s. to 22s. 6d. per week.	

<i>Midland.</i>	
Tuition, 10s. per week.	

The private poultry schools, and the commercial enterprises which take pupils, charge fees varying with the length of the courses and the accommodation provided.

At one well-known poultry school the terms are 10 guineas for a three-weeks' course, 30 guineas for 12 weeks, and 60 guineas for 24 weeks. Other small schools charge from £5 to £7 a month for tuition, board, and residence.

(b) **Openings in Poultry Work.** — *Own Holdings.* — Poultry-farming is an occupation which has attracted amateurs amongst men as well as women, perhaps more than any other outdoor profession, and, possibly as a consequence of this, there are more varied opinions about the openings connected with it than with any other branch of agriculture. Those who have failed to make a living out of it, or who have lost all their

capital, are legion ; this, however, should be no more than a warning to anyone not to take it up lightly without adequate knowledge and experience, and, possibly, the right instinct. There is now and will be an increasing demand for poultry produce of every description. The British are the stock breeders of the world ; and there is an unlimited home market for eggs and a good demand for table birds. Co-operative methods, which are wanted more perhaps in this branch than in any other to enable producers to compete with foreign prices based on co-operation, are slowly making headway. At the present stage of development of the poultry industry it is probably better to keep poultry as an adjunct to other farming operations than to have a poultry farm only. Many women have been met with who have taken up poultry-keeping on ordinary lines on a small scale, with not at all encouraging results. Others, however, have made a success of poultry-keeping on very different lines. It may be of interest to indicate briefly their several methods, if only to illustrate the different ways in which the industry can be approached.

(1) Mrs. B. adopted egg-production on the intensive method, and has been thoroughly successful with it. At the time of a visit she had 350 chickens under 8 weeks old in 8 foster mothers, standing in a yard which measured 7 by 13 yds. On one-twentieth of an acre in the garden there were 9 intensive houses of various patterns, containing about 250 to 300 hens—mostly White Leghorns. From 400 to 500 chickens a year are hatched ; and day-old chickens, eggs and stock birds are sold. The approximate number of eggs sold during the year is 30,000.

Mrs. B. had no previous knowledge of poultry work, and started keeping fowls in the ordinary way in the garden. Owing to the small space and the consequent ill-success of this method she decided to adopt the present system ; and where she formerly kept 24 fowls and had hard work to prevent insanitary conditions, she is now able to keep 400 to 500 birds without the slightest trace of discomfort. She considers that poultry-keeping would be a very remunerative employment for women if conducted on proper lines ; but it requires great care and judgment and thoroughness in details, the lack of which has caused many failures where the intensive method has been carried out without sufficient attention to the main points.

(2) "G." also goes in entirely for egg-production, but adopts quite a different system. She has 57 acres of land, part of a 200-acre farm, her brother farming the remainder as a separate concern. With the exception of two Suffolk mares, kept for breeding purposes, the entire stock consists of poultry, to which the land is devoted, the pasture being used for free range, and the arable for growing the bulk of the poultry food. The food consists chiefly of wheat, but also of barley and peas, most of the soil being unsuitable for oats ; while clover hay, swedes, turnips, mangolds and carrots are also grown.

At the time of my visit in May she had about 1,700 head of poultry ; of these 500 were Buff Orpington hens, mostly 4 or 5 years old, kept for rearing chickens, 300 White Leghorns for breeding purposes, and

over 900 cross-bred White Leghorns in the laying house; she was sending away an average of 800 eggs a day. The cockerels are disposed of at once, and the pullets run with the hens till September, when they are put into their laying quarters—a house 200 ft. by 16 ft., and accommodating 1,000 birds. The incubator house contains ten 200 egg-incubators heated by water pipes on the same system as in a greenhouse, a small petrol stove being used for heating purposes.

The annual net profit for the last four years has been estimated at quite £50 per 200 birds. G. took up farming 10 years ago, and it was on finding that poultry were the most paying stock she had, that she decided some years later to devote the whole of the land to it.

(3) "C.'s" holding is of an entirely different type. She devotes herself almost exclusively to poultry breeding, but includes other branches on a small scale purely for purposes of instructing pupils. She has 28 acres of land, and by a process of sub-letting the grazing of different fields in rotation she is able to get constant change of ground for the poultry and recovers most of the rent which would otherwise be chargeable to them. Also, of the land she keeps in hand one-third is in hay every year, and the hay is sold; the breeding pens are put up in October and go on till March, so that the land is free for hay in April. About 500 stock birds are kept and 1,500 birds are reared annually. A feature of the place is the large room holding 32 incubators, which are kept going from January to May. The employees consist of 1 foreman, 1 boy, and 1 lady; 4 pupils are taken for three-month courses, or for short courses of three weeks. C. set up for herself 20 years ago on half an acre with 20 hens; she had very little capital, and suffered from bad health, and considers that the only training she received on a poultry farm had to be unlearned before she became successful.

Salaried Posts in Poultry Work.—The salaried posts in connection with poultry-keeping, both for teachers and assistants, are very often combined with dairying; a considerable number of dairy posts now held have been obtained owing to the combined knowledge. It has been found also that many private employers desire to combine gardening with the poultry yard, and at some of the horticultural institutions students are advised to take a short course in poultry-keeping to enable them to undertake these situations. Otherwise the paid posts are chiefly as managers of exhibition farms or assistants to poultry farmers and breeders, who often prefer trained women to men, as they find that an educated woman is more careful and conscientious about details.

The wages offered are from £20, with board and lodging, upwards, the highest being about £40.

Teaching posts are few, but are likely to increase in number as public bodies realise the importance of the industry, and if the recommendations of the Committee on the Agricultural Education of Women are followed up. In Ireland, where the large poultry industry is entirely in the hands of the working women, there is an instructor in every county, and these teaching posts are only offered to women.

At present our county councils chiefly have men instructors and employ women assistants. Where the instruction is given in the form of evening classes, and the districts cover a wide area, there is often much night work on a bicycle, and a man is found more suitable than a woman.

From the opinions obtaining amongst those who have taken up poultry work it would appear that it is specially suitable for women. The hours are long, but the actual physical work is not heavy, although incessant, and one must be strong enough to be out in all weathers. To obtain success it is necessary to be very observant, patient, and attentive to details.

Co-operation for Women Farmers.

It must be pointed out that there are certain drawbacks connected with women taking up outdoor work which might be largely overcome if some workable form of co-operation could be adopted. These are the loneliness of the life, the tie involved, and the early difficulties in starting in new and untried places without much capital, or knowledge of how best to dispose of produce. Two attempts have been made to deal with the problem of helping women to work profitably on the land, with the aid of co-operative organisation and facilities. They have not, however, been in existence long enough to permit of a proper estimate of the probabilities of success, especially as war broke out just when they were trying to get a footing, and brought fresh difficulties. The details respecting these two pioneer movements are given below.

Women Co-operative Farmers, Limited.—This company was started in the autumn of 1912 for the purpose of providing a means whereby women trained in agriculture would be enabled to turn their knowledge to practical account by becoming small holders as tenants of the company.

The prospectus describes the general scheme as follows:—
 “To build up on its land a community of small holders who shall enjoy the utmost independence compatible with membership of the community and at the same time be intimately concerned with the welfare of the company as a whole; who shall secure for themselves the profits and the increase in capital value derived from the successful working and development of their holdings, and nevertheless have a direct interest in making their relationship to the company profitable to both parties.”

The authorised capital is £10,000, the shares being £1 each. £2,000 capital has been issued and £5,000 debentures.

A farm of 223 acres was purchased, and an adjacent one of 160 acres rented, on a high road three miles from Heathfield,

London, Brighton, and South Coast Railway, and $3\frac{1}{2}$ miles from Ticehurst Road, South Eastern and Chatham Railway.

The farm-house and 60 acres are reserved by the company to be developed as a model and experimental farm, and to serve as a training ground for the pupils ; the company are prepared to cut up the rest of the farm into small holdings to suit individual requirements as much as possible. The company intended, if capital were forthcoming, to erect the buildings and lease them with the land. Leases would be practically perpetual subject to a clause allowing the company to terminate the contract (1) for inadequate cultivation, (2) on a resolution by a two-thirds majority of the small holders. The tenant can transfer her lease to anyone approved by the company, and has the option of terminating it after three years. The company has already equipped a few holdings, but, owing to want of capital, has merely leased the land to others who have erected their own buildings.

Eleven small holders have taken up land and are all at work on holdings varying from 1 to 60 acres ; they pay from 30s. to £3 per acre for the land and 8 per cent. on the capital cost of the buildings. Ten pupils are being trained on the company's farm. Machinery and implements can be hired from the company by the tenants, and additional labour is supplied at times ; anyone going on a holiday can have her holding looked after in her absence. There is telephonic connection between each holding and the central farm, and between each holding. In this way perfect independence and freedom of action are obtained, with the possibility of social intercourse, advice as to cultivation, and help in the disposal of produce if this should be required. The produce is sold locally, and in Tunbridge Wells and Eastbourne. The company also owns a milling and bakery business, and has a brick yard and sand quarry on the estate.

Ensburys Growers, Limited.—This company was formed with the idea of meeting two of the difficulties encountered by women after a horticultural or agricultural training.

One difficulty is experienced where women have at once to find posts, in that these posts do not lead to independence, the salaries being such that there is no possibility of saving out of them. The other difficulty affects the woman with capital, whose isolation on land available for small or large holdings tends to the loss of profits of growing owing to the expenses of marketing.

The company proposed, therefore, to acquire land for two purposes : first, to make it available for women with capita

on market-garden leases, with access to co-operative labour, market and living, and to expert advice; secondly, to give employment under a qualified expert to trained women, who as employees would share in the company's profits, and who could rent concurrently small portions of the land on which to grow their own stuff, in their own time, thus laying the foundation of a permanent self-supporting holding.

The company is now in possession of 88 acres of land near Bournemouth, and is prepared to lease land on market garden leases at £5 an acre to women growers; the development of the land by the company itself for the employment and training of women was hindered by the failure of promised support owing to war conditions, but they have recently raised more capital and are giving effect to their object.

Agricultural Work in the Colonies.

Many of the women who have passed through the horticultural colleges, or who have studied dairying or poultry-keeping at the various centres, have learnt the work prior to leaving for the Colonies to be married. A few have gone out to take up the work there independently or to join relations on fruit and poultry farms. It is not possible with the information obtained to deal with the question of the openings and possibilities for women abroad, but attention might be called to two enterprises which have been started with a view to facilitating the openings which exist in other countries.

The Princess Patricia Ranch.—This settlement was started in 1912, under the auspices of the Colonial Intelligence League, to provide a centre in Canada where women who had already received training in England could gain experience in local conditions, and have time to look round before taking up land or work of their own abroad. They were to give their services free for one year in return for board and lodging. The ranch (which is near Vernon, Okanagan Valley, British Columbia) comprises 13 acres. Cows, pigs, and poultry are kept; and vegetables and small fruit are grown besides the crops required for the stock. After a year's work by the first batch of girls the Deputy Minister for Agriculture visited the ranch, and was so struck with the excellent progress that he made a recommendation to the Government of British Columbia that they should take over the ranch as a Government Demonstration Farm, supplying advice, supervision, plant, and stock, while the work would be carried out by the associates of the League as hitherto. His recommendation had just been adopted when war broke out, and the Government reconsidered their decision. For the moment the ranch

is being kept in cultivation by two women, one of whom was a former resident, the League paying the rent, rates and taxes, and the women receiving the profits. It is hoped that after the war the original intentions of the League regarding it can be resumed, and will be the means of attracting women who have received outdoor training to take up this work under the freer conditions which are prevalent in the Colonies.

Women's Farm Settlement in South Africa.—The object of this settlement is "to provide a centre in South Africa where women and girls, with some means of their own, can obtain sound instruction and experience of agriculture and household management under local conditions and train for a life of enterprise and usefulness."

A small farm was leased in 1913 near Potchefstroom in the Transvaal. It consisted of 39 acres, in orchards, lucerne fields, and flower and vegetable gardens. A valuable asset was its proximity to the agricultural college situated on the Government Experimental Farm, where various facilities and privileges were allowed to the students of the Settlement. The enterprise had barely begun when war broke out, and it has had to be temporarily abandoned.

(3)—SUMMARY.

We have now considered what training exists in the various branches of horticulture and agriculture, and have briefly reviewed the prospects for subsequent employment.

In *Horticulture* we have found that until the outbreak of war the salaried posts were limited in number, and that the salaries, although often higher than those accorded to male gardeners of the working class, were low relatively to the expense of training, and did not admit of saving for illness or old age. Of those who have set up on their own account, a very few have struck out along new lines and done well. Putting these aside, practically none is making an entire living without the aid of pupils; those who have started under proper conditions are supplementing small incomes and leading the outdoor life, which they prefer.

What has been said above applies also to *Farming* on a small scale. In normal times there are practically no salaried posts at a living wage for educated women in farming.

In *Dairy and Poultry Work*, while the training can be obtained at less expense, and for the lower posts in less time, the better paid posts are fewer in proportion, and require long experience. Those who wish to set up for themselves would probably find that training in dairy work alone would only enable them

to run some form of retail business or a cheese factory (both of which involve business capacity, and cannot be classed as outdoor work), for dairy farming entails experience in agriculture as well as in dairy work proper. Poultry farming is carried on successfully by many women, but is a very risky occupation for anyone without proper experience.

Apart, however, from the commercial point of view, there are certain advantages in outdoor work to which a money value cannot be attached; and to many women the important point may be not so much whether gardening or farming pays, but whether an intelligent woman, coming into it from the outside with certain qualifications, and having had sufficient training, can hope to supplement a small income or, alternatively, be able to live after having invested in it the few hundred pounds she possesses. The answer is that quite a number of women are doing this; they find the work congenial, though hard, and the life healthy. Those who have not invested all their capital in the business, but retain a small private income, are not involved in an actual struggle for bare existence. They have their own homes, and live an independent life; they get many of the necessities of life thrown in which in another class on the same income would be regarded as luxuries, such as fresh air, fresh eggs, butter, vegetables, and milk, and possibly a pony to drive, and they can wear old clothes. The life is not monotonous to those who understand it, but full of change with the varying seasons and the different work the seasons bring.

As already observed, a money value cannot be put on these things, but to women who prefer the country to town life, and to whom a rural career, even if attended by a reduction in income, would be preferable to more highly paid but uncongenial work in town lodgings or private situations, the advantages are priceless.

Those, however, who are dependent on social intercourse must realise that they may be largely cut off from this. Also, if they have no liking for the life it is drudgery, for there is very little leisure, and much hard, continuous work; there is nearly always Sunday work, and week-ending and holidays are only possible when substitutes can be obtained to do the work—and substitutes as often as not involve some mishap.

How far these drawbacks can be overcome by co-operative colonies, where personal independence is at the same time assured, is still a matter of experiment.

It must also be remembered that the answer to the question whether women can make a living on the land depends to

a considerable extent on what is to be regarded as a living. The profit that would keep a man and his wife, the wife doing the housework, would be quite insufficient to keep two educated women, if they are to live with any of the comforts they are accustomed to.

As regards salaried posts the war has caused a large number of employers to adapt conditions of work, in such matters as housing accommodation, provision of meals, etc., to the needs of women. It remains now with the women to make employers realise the difficulties of women workers who are doing work usually done by men of the working class, and the demands which they may reasonably make in view of their somewhat higher standard of life. It is for them also to overcome prejudices on the part of fellow workmen as well as employers. Tact and competence, now that the doors are open, will go far to obviate existing difficulties; while, on the other hand, unreasonableness and incompetence will do the profession an immense amount of harm.

THE GOAT AS A SOURCE OF MILK.

H. S. HOLMES PEGLER,

Secretary, British Goat Society.

Although kid's flesh forms a most acceptable dish, and even the flesh of the mature goat is by no means unpalatable, goats in this country are kept entirely as a source of milk and not in part for meat production as in many districts abroad. The supply of pure, wholesome milk is, needless to say, a matter of national importance, for, in contributing to the health and vigour of the rising generation, it is benefiting the community as a whole. It is to be feared, however, that in many rural districts cottagers living outside the area of delivery by milk carts are only able to procure milk with considerable difficulty, and, indeed, amongst a proportion of labourers' families fresh milk is unobtainable. The reason for this is that in some districts practically all the milk is sold under contract to large distributing firms in the metropolis or other large towns, or to co-operative milk depots, and, when this is the case, little or none is retained for use locally. The result is that even labourers engaged on the farms frequently find it difficult to obtain milk for their families. Even in districts where the milk is not disposed of in this way, it may be made into butter and cheese when only skimmed milk will be obtainable. In both these instances goat-keeping would be especially beneficial.

All the objections which apply to the keeping of a cow by a cottager are met in the case of a goat. The first expenditure for its purchase is within his means ; housing accommodation is reduced to a minimum ; the food in summer costs very little, and there is no great expense to be borne for the maintenance of the animal in periods when it is unprofitable.

It is for domestic rather than business purposes that the goat is here recommended. Some writers have maintained that there is a fortune to be made out of goat-farming, but under present conditions this is not the case. It would not be wise for anyone, especially if possessed of only a small capital, to embark in any such undertaking in the hope of making a living out of it. The reason is simple. There is no demand on anything like a commercial scale for goats' milk, and though the demand for goats is large and ever-increasing, it is very doubtful if the breeding and rearing of stock for sale would be a profitable venture.

It may be quite possible for individual goat breeders, who have been fortunate in securing the custom of a hospital or private patients in the locality, to make the industry profitable, as the milk may then often be sold at 1s. a quart, but such opportunities are very rare. Any attempt to sell goats' milk on a commercial scale is, moreover, seriously handicapped by the difficulty of maintaining a continuous supply of milk during the autumn and winter months.

Goats' Milk.—Unfortunately, there has been for many years a widespread belief that goats' milk always possesses a peculiar flavour. It will generally be found on enquiry that people who hold this opinion have based it on their experience as tourists in Switzerland. This flavour may possibly be caused by the consumption of certain herbs, but it is far more probable that it arises from a want of cleanliness in the utensils employed. It is quite certain that the milk from the same Swiss breed in England is not so affected, whilst it is also true that all goats' milk will develop a "goaty" flavour if strict attention is not paid to hygienic conditions.

There are two special qualities possessed by goats' milk which alone should make it popular :—

1. The ease with which it is digested by children, and especially infants.

2. Its almost complete immunity from germs of tuberculosis.

With regard to the first point, the substitution of goats' for cows' milk has been instrumental in saving many young lives. The explanation of this superior digestibility is furnished on

scientific grounds by at least two authorities. The late Dr. Augustus Voelcker held that it was due to the fact that the cream globules were much smaller than in cows' milk, and in a more perfect state of emulsion. The explanation of Dr. Barbellion, a French medical authority, is that the curd of cows' milk forms a dense adhering mass which by agitation separates into clots that are but slightly soluble, but the curd of goats' milk forms very small light flakes, which are soft, very pliable and very soluble, like those in the milk of the ass and in human milk. Samples of these latter as well as goats' milk were submitted to the action of digestive ferments and were found to be digested completely in 20 hours, whilst the same process applied to cows' milk showed only a very slight progress after 60 hours.

So much has been written on the prevalence of tuberculosis amongst cows and the possibility of communicating the disease to the human subject through the milk that, when it is fully recognised how comparatively free from such germs goats' milk has been proved to be, this valuable quality should stimulate its use. In this connection Sir William Broadbent may be quoted. In his address to students on the "Prevention of Consumption and other forms of Tuberculosis," he said: "It is interesting to note that asses and goats do not suffer from tuberculosis, and to bear in mind that the shrewd physicians of past days used to order asses' and goats' milk for persons threatened with consumption."

Goats' Milk for Domestic Use.—To realise the difference between goats' and cows' milk one has only to return to the latter after a course of goats' milk. The difference is very much the same as when skimmed milk is substituted for whole milk. This superiority is not so noticeable when goats' milk is drunk by itself as when it is taken in tea or coffee, or used in milk puddings, custards and blanc-manges; the rich, creamy taste is then very marked. The taste may possibly be accounted for by some of the reasons given in regard to digestibility. It cannot be entirely ascribed to a higher fat content, because, although in a general way goats' milk contains 2 per cent.—and sometimes 4 per cent.—more butter-fat in its composition than cows' milk, the same distinctive quality of goats' milk is to some extent observable even in cases where the fat content is less than that of cows' milk.

The Yield of Milk.—An average goat will give at its flush 3 pts. a day. A good many give more and a few give less; but a goat yielding less than 1 qt. at that stage is

hardly worth keeping. This flush of milk should last for at least three months, though the later in the season the goat kids, the greater is the tendency for this period to diminish. Thus, a goat that kids in July will seldom maintain her first yield as long as one that kids in March, whilst, should kidding take place during the rutting season—that is, in October, November and December—the maximum period will be still shorter. The goat which has been giving 3 pts. daily from March to June may be expected to give on the average a quart for the next three months, and if during the subsequent three she gives about 1 pt. a day, the yield may be considered satisfactory. The total milk yield will have amounted to about 67 gal., or 670 lb., which, at the cheap price of 5d. a quart, represents a value of £5 11s. 8d. Better milkers will give 2 qts. for the first three months, and their total yield may be set down at from 80 to 90 gal., whilst the best goats may sometimes yield 3 qts. In exceptional cases even larger yields have been recorded. "Sedgmore Faith," an imported Swiss, milked daily for five days, gave an average yield per day of 10 lb. 5 oz., or over a gal.; this was, moreover, in the month of August after having been in milk for five months. The champion milker, "Leazes Eve" (Fig. 5), yielded during the three weeks ending 18th May, 1912 (having been in profit since 27th April), no less than 242 lb. 13 oz., or over 97 qts. This goat indeed gave nearly half a ton of milk during the first 15 weeks after kidding. Champion "Wigmore Topsy" is another extraordinary milker that has given over 1 gal. a day. The illustration (Fig. 6) shows her excellent udder and well-shaped teats. It should be pointed out, however, that these yields are rare.

Cost of Food compared with Value of Milk.—In estimating the cost of keeping goats to provide milk for home consumption, it is understood that they are fed by a member of the family and that no land is rented especially for them. Rent and wages may, therefore, be neglected. Opinions vary as to the cost of feeding, but it may be said that, with a paddock or good-sized kitchen garden available, the cost of keep during the six months of spring and summer should not exceed 1s. a week per goat, or say £1 5s. During the remainder of the year, under the "soiling" system, to be explained presently, the goat will consume on an average each day 2 lb. of hay, costing 1d., about $\frac{1}{4}$ lb. of oats and 2 oz. of bran, which may be set down as amounting to another 1d. or a total of about £1 10s. During the short period that garden produce is not available roots will have to be purchased, and the cost of these would

bring the total for the other six months to, say, £2. This, added to the £1 5s. previously mentioned, makes £3 5s. per annum. Even with an average goat it will be seen that a very fair profit is made. With a superior milker the profit would be considerably greater. The cost of litter—peat moss or straw—and other incidental charges such as service of goat, etc., have not been included, as the value of the manure, no insignificant item, may be set against the former, and the value of kids against the latter. The above is only a rough estimate, and the cost is not based on the prices quoted on the market to-day, but on those prevailing in normal times. On the other hand the costs suggested would be greatly reduced if the extra foods were purchased in fairly considerable quantities.

Habits of the Goat.—The goat is naturally of a roving disposition. It passes rapidly from one form of food to another and rarely stops more than a short time at each, however sweet and attractive it may be. When a goat's fancy can be thus indulged it thrives amazingly, but, unfortunately, its innate delight in mischief—apparently for mischief's sake—renders it necessary to keep it under control. Ordinary fencing is generally useless, for a goat will jump hurdles readily and make its way through the thickest hedge if the least weak spot is to be found. Unless the lines are set very close even barbed wire will not prove an effective bar, should there happen to be any very tempting bait on the other side. Where pasturage is provided, therefore, tethering is necessary. To make this system of feeding successful, frequent change of ground should be possible. Some people endeavour to keep a goat within the narrow limits of a tennis court or a lawn throughout the summer. It is possible that were such a plot reserved entirely for the goat and scarcely ever trodden on by human feet it might provide nourishment for the animal for a certain period, but after a time the soil becomes tainted and the grass practically poisonous to the goat. This result is evidenced by the loss of flesh, anæmic condition, and the other well-known symptoms of a fatal disorder which for want of a better name, has been called "a disease peculiar to goats." As a matter of fact, pasturage is by no means necessary to goats, and, unless they have the range of a big meadow or a park, they will live longer and thrive better generally speaking, without it.

Tethering.—There are two methods of tethering: (1) by a chain, about 3 or 4 yds. long, attached to an iron pin

driven into the ground, and (2) by using a length of thick, galvanised wire, or, better still as being stronger, one composed of several strands of thin wire twisted together. This wire, which may be 20 yds. or more in length, should be stretched firmly along the surface of the grass and securely pegged down at each end. The goat may then be attached to the wire by means of a short chain, one end of which is fastened to the goat's collar and the other hooked on to the wire by means of a spring hook. The hook moves backwards and forwards with the progress of the goat, which has thus the whole 20 yds. as a length of run. This method of tethering allows the goat greater freedom than is the case when a single tethering pin is used. In both cases, however, it is most essential that the pin be driven close down to the level of the ground, otherwise the chain is liable to get caught on, and wound round, the projecting head, thus restricting the amount of liberty allowed the animal. A cord should never be used for tethering, for when it becomes wet it twists and brings about the same result. The length of the pin will depend on the kind of soil—say, 2 ft. on light soils and 18 in. on heavy land.

It is necessary to warn the goat-keeper not to attempt tethering from the middle of October to the beginning of April. Grass in winter has but little nutritive value, whilst exposure to cold winds and the elements generally without the necessary shelter, or exercise to promote circulation, often causes lung trouble and diarrhoea. It is desirable, also, that the change to grass in the spring should be gradual, or the fresh herbage is certain to cause bad attacks of scour, which, if neglected, may have a fatal termination.

Housing and the "Soiling" System.—During the autumn and winter months goats are best kept on the "Soiling System," that is, the animals are housed and all their food is brought to them. Where a considerable number are kept it is advisable to erect a special goat-house, or to adapt some existing building for the purpose. A simple form of house is a loose box or out-house, bedded down with peat-moss litter. Feeding receptacles, preferably small galvanised pails, may be arranged on one side, a hay-rack on another side, and a long bench about 2 ft. wide and the same height from the ground on a third side. This bench serves as a sleeping as well as a milking bench. Goats prefer a hard bed, and especially one that is raised above the level of the floor. The objections to the loose box are that when the inmates are strangers to one another they are apt to

fight, and when one acts the bully she prevents her companions from getting their share of food. In the former case the goats will probably fraternise as they get accustomed to one another, but in the latter the troublesome animal should either be removed or fastened to a ring in the wall. An alternative plan to the loose box is to erect miniature stalls. Space does not admit of details for the construction of such stalls, but these may readily be obtained by consulting one of the books on goat-keeping. Stalls occupy less space, but give more trouble, as they require cleaning out daily to keep them sweet; further, unless the stall is quite narrow— $2\frac{1}{2}$ ft. in width at the most—and the stall chain quite short and fastened to the centre in front and not at either side, the goat is likely to turn round, in which case the droppings fall into the feeding pail and get mixed with the food.

Points in Feeding Goats.—The goat-keeper must bear in mind three important points in feeding his stock. The first and most important consideration is absolute cleanliness, both in the food itself and in the receptacle for it. The best form of receptacle is a metal pail; wooden mangers are objectionable as they get gnawed away and are more difficult to keep sweet. The second point is that variety of food is essential; no animal tires so quickly of the same food as the goat, and it will soon give up eating if a change is not provided. The third point is one of economy. If a goat is fed carelessly, without due regard to its tastes or capacity, it may cost as much as its return in milk is worth; thus hay may be wasted to any amount if thrown on the ground or if placed in the hay-rack in needlessly large quantities. In order that this fodder may not be too readily pulled out and only tit-bits consumed, it is necessary that the bars of the hay-rack should be not more than $1\frac{1}{2}$ in. apart. A still more economical plan when hay is scarce and dear is to give it only in the form of chaff mixed with oats and bran. Oats again will be wasted if mixed with the residue of the previous meal. Bran is best given by itself, either dry or still better as a mash. It may be added to chopped roots or potatoes, but never to corn, since to obtain the corn more readily goats will often blow away the bran. Middlings or sharps may be given instead of bran for a change with chopped vegetables.

From their kid stage goats should be encouraged to eat all vegetable waste from the kitchen, or household scraps, such as broken bread, bits of toast, boiled potatoes, oatmeal porridge,

etc. In the garden there is scarcely any plant which is not acceptable. The greatest care should be taken, however, to prevent goats from eating such more or less poisonous shrubs as rhododendrons, yew, privet, and laurels. When the supply of garden produce fails, swedes or mangolds should be purchased if they can be obtained at reasonable prices. To save trouble to the attendant, and also to keep the goat occupied, these roots are best given whole, after careful washing, but they may be chopped into "fingers" as for sheep. In the former case the goat will scoop out the flesh, leaving the outside skin as a shell.

In summer, grass may be cut and supplied instead of hay; this is the most economical way of utilising it. People who live in the heart of the country can take a goat along the lanes for a walk like a dog, allowing it to nibble at the roadside as it goes along.

How to start Goat-keeping.—One of the greatest difficulties which beset the prospective goat-keeper is to obtain suitable stock. The best specimens of goats are frequently sent to the Colonies and the United States of America, and as no fresh stock can be imported from abroad to replace them, it is necessary to depend entirely on home-bred animals. There is still available a fair number of common goats, but many beginners are too ambitious and wish to start straight away with expensive pedigree goats. It is much better to begin with the common goat costing up to £2 or £3, and to improve the stock later. This may be accomplished in the following manner: Well-bred kids of good pedigree may often be obtained comparatively cheaply by previous arrangement with the owners of well-known strains. The purchaser should endeavour to procure only Herd Book stock with, if possible, "milking blood" on the side of both the sire and dam, but at least on one side. When the common goat has a kid or kids, these should be destroyed at birth and the unweaned kid of superior pedigree should be fostered upon it; this may be easily done if the kid is under a fortnight old. The cost of the pedigree kid may be 15s. or even a guinea, but the money will be well spent, as the stud fee would probably have amounted to as much.

Herd Book stock should not be confused with animals that are merely entered in the Kid Register. Novices in goat-keeping are unfortunately often deceived by the statement that a goat is "registered." This word is frequently used to give the impression that the animal is entered in the Herd Book, but though most of the entries in this volume appear also in the

Kid Register only a few of those in the latter will be found in the Herd Book. The Kid Register, it should be explained, is in no sense a record of pedigree but merely a guarantee of age, and is intended chiefly as a qualification in that respect for competition in kid or goatling classes. Every goat that is entered in the Herd Book is given a number, and that number is supplied on the certificate card issued by the Herd Book Editor of the British Goat Society.

In selecting a goat it is well to remember that there are certain features which may be regarded as characteristics of milk production. The body should be long and fairly deep, although if the latter point is very marked it is probable that the animal is aged. The ribs must be well sprung—this is important—whilst a long head and a slender neck are generally considered to indicate a good milker. If the goat is dry the quality of the udder cannot be ascertained, but if in profit the udder should be carefully examined. It should not only be of good size but soft and pliable, and the teats should be long and pointed, as they are then most easily handled. It is always desirable for the purchaser to see the goat he is about to buy milked at least once before parting with his money. This is necessary not merely to ascertain the actual yield but to find out if the animal stands quietly to be milked, as a good milking goat is often parted with on account of the trouble she gives the owner in drawing the milk from her. A goat purchased in profit should not be less than two years old or over five. The age can be detected by examining the teeth, for particulars of which the reader should refer to the various books on the subject.

The Breeds of Goats.—In this country there are at most five breeds of goats, two of which belong to what may be called the common kind, and the other three to the improved varieties. The first are the English and the Irish goats, the former being short-haired, with horns rather small and branching outwards, and the latter long-haired with more upright horns. Both are prick-eared and, with slight differences, resemble the common goat in other parts of Europe. The superior breeds in their order of value as milkers are the Toggenburg of Swiss origin, the only strictly pure breed we possess, and the Anglo-Nubian, a variety now regarded as a separate breed but produced many years ago by crossing the English goat with imported stock from the East. A separate section in the Herd Book is devoted to this variety and another to the Toggenburg.

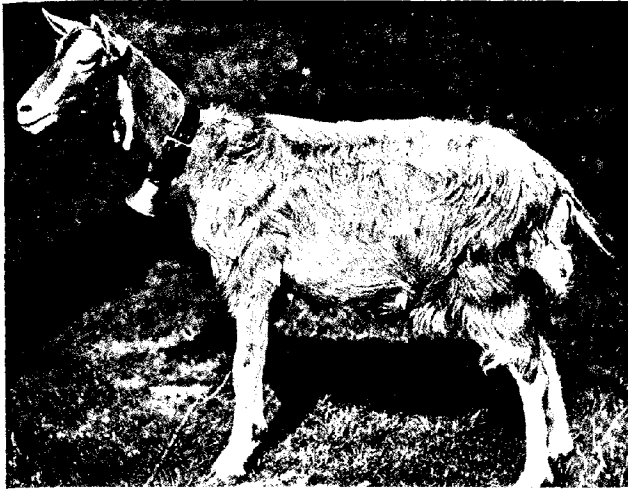


FIG. 1.—A Toggenburg from the Toggenburg Valley, Canton St. Gall, Switzerland.



FIG. 2.—Group of Toggenburg Kids.



FIG. 3.—Saanen Goats imported into the United States from Switzerland.

As regards the Toggenburg, a description is advisable to enable anyone not an expert to recognise a true specimen. This is the more necessary, as, in consequence of its comparative rarity in this country and the high prices it commands, goats of inferior breeds are frequently sold to the uninitiated. The chief peculiarity consists in the colour, which is invariably a light drab, though when the hair is long it approaches somewhat to sandy. This colour is relieved by white markings which are shown on the head by a white streak down each side of the face, a white muzzle, and ears having more or less the same absence of colour. White is also present under the tail, on each side of the rump, on the limbs from the knee and hocks downwards, and very frequently under the belly. The accompanying illustrations (Fig. 1 and Fig. 2) show most of these markings and also two tassel-like appendages which are almost invariably present, though not restricted to this breed. Horns are often seen on the Toggenburgs in England, though in Switzerland they are rarely met with, the breed being there regarded as hornless. The Saanen, also known as the Appenzell, another Swiss breed, is like the Toggenburg in form, but is entirely white. Fig. 3 gives a good illustration of this variety.

In addition to these breeds, there are what are known as "Swiss" and "Anglo-Swiss," the former being a cross between the Toggenburg and other Swiss breeds, and the latter a cross again of these with the common goat or the Anglo-Nubian. Probably this last cross represents the best all-round goat we possess, as it combines the heavy yield of the Swiss, be it Toggenburg or Saanen, with the superior quality as regards butter-fat, of the Anglo-Nubian. A good specimen of this cross is shown in Fig. 4, whilst Fig. 5 illustrates a similar combination, but with the Saanen in place of the Toggenburg, the Swiss here predominating over the Eastern blood. To the average goat-keeper who wants a milker and cannot afford a high price the matter of breed need not be greatly considered. Nearly all the best milkers of the present day are cross-bred animals, the result of careful selection from known milking strains. A careful study of the Herd Book, which is issued in parts, will reveal the strains in which the milking feature predominates, as each part contains what is called the "Star Section" restricted to winners of milking prizes. Goats in this section have one or more asterisks affixed to their names to indicate this attribute. The student of goat-breeding is, therefore, recommended in making his selection to trust more to the strain than to the breed in starting a herd of milkers.

Breeding.—The pairing season for goats is from September to January, but the sooner the service can be arranged the better, as it is desirable that the female should have her kids in February or March, so that the young ones may have all the spring and summer before them. The period of gestation is about 21 weeks, or roughly five months. She-goats that have not been served previously will come into season during January and even, though less frequently, in February, but after that month oestrus will occur only very exceptionally until the following September. People who keep three goats—and this number is necessary to provide an average family with milk during the greater part of the year—should endeavour to arrange for the service of one in September or early in October, the second in November or December, and the third, if possible, in February.

Signs of oestrus in the female are in some cases very transient, especially in the late spring and summer. These signs consist in frequent bleating, a constant shaking of the tail, a turgid condition of the vulva, loss of appetite, and restlessness, and if the goat is in milk a temporary diminution in the milk yield. This condition will last from one to three days.

It is essential, if the owner is endeavouring to improve his stock for milk production, to secure the services of a male bred from a good milker, or, still better, having "milking blood" on both sides of his parentage. The kids will then be worth rearing; otherwise it is far better to kill them at birth and to use all the milk from the goat for domestic purposes. It seldom pays to rear male kids, and it is usually less expensive to pay even a guinea fee for the services of a good male than to rear and keep a stud goat, as the odour and objectionable habits of these animals render them anything but desirable pets.

A she-goat that has given birth to kids generally recovers without much difficulty. If it is decided to rear the young ones they may be left with the dam for six or eight weeks and then weaned, but if the value of the milk consumed during this period is reckoned, the kids will be found in most cases to have cost more than they are worth.

Milking and Care of Milk.—For the first three or four days after kidding the milk is specially adapted to the young kids and is not suitable for human consumption. After that time, however, the goat can be milked at least twice daily, or three times if the yield amounts to something like a quart on each occasion.



FIG. 4.—An Anglo-Nubian-Toggenburg,
showing development of udder.



FIG. 5.—“Leazes Eye,” Anglo-Nubian-Saanen,
A Champion Milking Goat



FIG. 6.—“Wigmore Topsy,” A Gallon Milker.

Milking consists in sliding the first finger and thumb along the teat and squeezing out the milk. It is an operation easily learnt, but requires some practice before the requisite facility can be acquired. In regard to milking two points should be emphasised. Milking should be carried out at regular intervals and the udder completely emptied each time. The more quickly the milking is performed the better, for if lingered over the goat gets fidgety and impatient and is very apt to place a hoof in the pail or pan, or to upset the receptacle. An impatient animal should therefore be carefully watched towards the end of the operation, and any such movement prevented as far as possible. It is a good plan in such cases for the operator to have an empty jug placed beside him, in which to pour the milk as the process goes on. The last drops, or "strippings," are always the richest.

All utensils must be kept scrupulously clean by scalding with boiling water and exposure for a time to the air, so as to avoid all odour of stale milk. As milk is easily contaminated, it should not be brought into contact with any strong-smelling substance. When the milk is brought from the goat-house, it should be drained through a clean butter-cloth, placed over a perforated basin, into the pan intended for its reception. It should then be stored in a cool place—a dairy for preference—till required for use.

SUGGESTIONS FOR SAVING LABOUR.

THE necessity for economising labour, already pressing, is likely to become more insistent in the near future. Farmers, therefore, should carefully consider whether modifications of some of the usual farming methods might not help them to tide over a difficult situation.

In cases where wheat is taken after potatoes, and the land is clean and friable, ploughing may be omitted, and the seed sown broadcast and cultivated in. Similarly, adopting a common northern practice, broadcasting might take the place of drilling on grass land turned over in crested, well-packed furrows. After mangolds, too, on free-working land devoid of weeds, the seed may be drilled or sown broadcast, and immediately ploughed under lightly with a double-furrow plough. These are suggested as typical examples of cases in which both time and labour may be saved. As against the saving of labour it should, however, be pointed out that broadcast sowing requires about one-fourth more seed than drilling.

Where hand-hoeing of corn crops is practised, the distance between the rows, usually from 6 in. to $7\frac{1}{2}$ in., might be increased to 8 in. or 9 in., to permit of easy horse-hoeing.

In general, however, where horse-hoeing cannot be practised, the wetter the climate, or the more the land is subject to the growth of annual weeds, the closer the drill coulters should be set. When weeds are plentiful it is advisable, immediately after harvest, to disc or lightly scarify the surface of the land, to encourage the germination of annual weeds, which should afterwards be ploughed in.

Under the Norfolk four-course rotation the area devoted to roots imposes a severe strain on labour, even in normal times. At present all indications point to the necessity for modifying the usual practice. It is well known that success in root-growing, and the welfare of the crops that follow, depend largely on careful, thorough, and persistent cultivation of the root "break." Anything short of this endangers the supply of winter keep for stock and encourages weeds. It is desirable, therefore, that farmers should adopt every practicable means of suppressing weeds at all stages of the rotation, *e.g.*, by the growth of heavy corn crops, and the inclusion in the root area of such crops as will suppress weeds, save labour, and provide keep for stock in winter.

The following examples are intended to indicate the lines upon which the cropping of the root "break" might be arranged. It must be clearly understood, however, that the crops selected, and the area devoted to each, will vary with the soil, the climate, and the nature of the live stock kept.

1. *Vetch Mixture, Marrow-stem Kale, Mangolds.*—*Vetches* are one of the best "smother" crops in cultivation; they form an excellent preparation for succeeding crops, and they are easily grown. For forage purposes they should be sown in autumn with an admixture of cereals and a few beans. The cereals and beans will provide support for the vetches and facilitate cutting. For soiling or ensilage, it is usual to drill from 2 bush. to 3 bush. of winter vetches per acre, along with 1 bush. to $1\frac{1}{2}$ bush. of winter wheat, rye, or oats or a mixture of these, and about $\frac{1}{2}$ bush. of beans. When required for hay the proportion of vetches should be reduced, as an additional precaution against lodging and to enable the crop to be stacked quickly. A useful mixture for a vetch hay crop intended to provide fodder for cattle or sheep would be 70 lb. of winter vetches, and 2 bush. to $2\frac{1}{2}$ bush. of winter

oats per acre. Beans should be omitted when hay is the object. The right time to cut is when the small seeds in the pods at the base of the plant are about half formed. If left too long the crop becomes fibrous and stock refuse it; on the other hand, if cut too young the vetches will wilt and fall to dust. The method of cutting and saving the vetch mixture is precisely the same as in the case of "seeds" hay, except that it is desirable to sweat the crop in the stack a little more. The crop should be ready for cutting about the middle of June, a time of year when the rainfall is usually low and the sunshine abundant. No great difficulty, therefore, need be anticipated in making it into hay. In wet seasons or in a damp climate, it should be made into silage. After the removal of the vetch crop the ground may be ploughed or cultivated and left uncropped until sown with wheat in autumn, or it may be disced or scarified and sown with an autumn catch crop such as white mustard, rape, or soft turnips (unsingled) for sheep folding.

Marrow-stem Kale resembles Kohl-rabi, but possesses a longer and thinner stem, and is topped with a bunch of green foliage similar to that of Thousand-headed Kale. Stock readily eat both stems and leaves, and the crop may be soiled or fed on the land from late autumn up to Christmas. After that time the stem gradually becomes more fibrous and less palatable. It is one of the best drought-resisting crops grown in this country, and is usually sown in the same way as turnips from the middle of April till the end of June.

It may also be sown like rape and thinned, if necessary, by cross-harrowing, or other mechanical means.

As regards *Mangolds* it need only be stated that, to relieve pressure of work in spring and ensure quick germination and early growth, the land may be dunged, and, if clean, ridged up in autumn, and the winter tilth and moisture preserved, as far as possible.

2. *Vetch Mixture, Thousand-headed Kale, Mangolds*.—This arrangement is suited to a wider range of conditions than the first example, by reason of the fact that Thousand-headed Kale may be allowed to stand over the winter.

Vetches and Mangolds.—See foregoing notes.

Thousand-headed Kale, when drilled in July or August, well manured and afterwards singled, under favourable conditions will supply a valuable and very bulky food for both sheep and cows in early spring from March onwards.

When sown in March, April, and May the crop will be ready for use in October, November, and December.

Thousand-headed Kale has taken the place of rape in many districts, as it yields a heavier crop. It reaches its maximum development on good land after being singled, but in the ordinary course, when the crop is grown for autumn use, or on the poorer classes of soil, it is probably better left unsingled. If not too closely grazed it will produce a second crop after folding. It affords excellent food and shelter for ewes and lambs in early spring. It is extremely hardy, and is capable of resisting both frost and drought.

The seed is drilled at the rate of 4 lb. to 6 lb. per acre, or sown broadcast at the rate of 10 lb. per acre. The crop transplants well.

3. *Vetch Mixture, Swedes, Mangolds*.—This arrangement is suited to a damp climate, and may be preferred by those who are accustomed to rely largely on swedes for the winter feeding of sheep. In the warmer southern counties, Kohl-rabi may be substituted for swedes.

Vetch Mixture.—It may be desirable to convert the vetch mixture into silage, in which case the area under roots may be reduced to a minimum. (See Leaflet No. 9, *Ensilage*).

Swedes.—The same remarks apply as to *Mangolds* above.

The examples given above will not meet all cases, and other crops may have to be included for feeding in late autumn, (cabbage, rape, or maize) and in late spring (rye). Further particulars as to supplementary forage crops will be found in Special Leaflet No. 28 (*Suggestions for the Cultivation of Catch Crops and Home-grown Feeding Stuff*s). The fewer the crops, however, and the better the distribution of labour throughout the year, the less will undue pressure be felt at any particular season.

It will be noted that the essential difference between normal practice and the cropping suggested in the examples given, lies in the introduction of a vetch mixture as a partial substitute for roots. Numerous experiments conducted throughout the country have clearly indicated that in England the feeding of unlimited quantities of roots, or even quantities much in excess of $\frac{3}{4}$ cwt. per head per day, to full grown cattle is distinctly wasteful. It has further been shown that a very moderate allowance of roots, say, half of the quantity stated above, supplemented by other foods, such as chopped fodder, treacle, cake, and meal, will suffice at relatively little expense to fatten most cattle. Similarly, less than the usual quantities

of roots might often be given with advantage to young cattle and dairy cows. Several farmers in East Anglia have already curtailed their root area, and depend entirely upon silage, made from a vetch mixture, to supply the succulent portion of the winter rations of milch cows and young, growing cattle.

Well-made vetch hay is admirably adapted for feeding along with foods rich in carbohydrates, such as roots, straw, and the starchy cereal grains and offals. It might also be used partly to replace the more expensive albuminous cakes and feeding stuffs.

In an experiment* conducted recently on the farm of Sir Horace Plunkett, in County Dublin, it was found that for winter milk production a daily ration consisting of—

14 lb. Oat and Vetch Hay,
14 „ Meadow Hay, and
70 „ to 84 lb. Rape or Hardy Greens,

proved quite as useful as :—

21 lb. Meadow Hay,
56 „ Roots,
3 „ Maize Meal, and
7 „ Decorticated Cotton Cake.

It was estimated that the cost of the former ration was approximately half that of the latter.

The vetch mixture will yield, on the average, about 14 tons per acre of green forage or an equivalent in dry matter of about 20 tons of mangolds. The ratio of green weight to dry (hay) weight will vary according to the conditions under which the forage is grown and the state of the weather during hay-making, but it will be safe to assume that 14 tons of vetch forage will yield, generally, about 3 to 3½ tons of hay per acre. Made into silage in a modern stave or concrete silo the shrinkage will probably be about 10 per cent. In a stack silo it may be much higher unless great care is taken in the making. The fact that vetch hay or vetch silage has to be made about the same time as ordinary hay will not permit of much leisure at that particular season of the year, but it should not be forgotten that silage may be made during damp or showery weather, and that, as regards hay-making, machinery has rendered the farmer to a large extent independent of manual labour. On the other hand, the labour of feeding hay or silage is insignificant as compared with that incurred by feeding roots.

* See articles on "Continuous Cropping," by T. Wibberley, in this *Journal* for November and December, 1914.

LAYING COMPETITION AT BURNLEY.

EDWARD BROWN.

FOR nine years the Northern Utility Poultry Society, which is largely composed of artisans in a great manufacturing centre, has conducted laying competitions. The earlier of these were for 16 weeks. The competition described in this article extended over a period of 12 months, from 15th October, 1913, to 4th October, 1914, the report of which has been issued by the Society.

In no part of the United Kingdom has the keeping of poultry for egg production, as a supplementary pursuit, been developed during recent years to a greater extent than around Burnley. The development has necessarily been more or less intensive in its nature owing to local conditions, among which must be mentioned the high cost of land for allotments, and also to the realisation of the fact that the poultry plants should be conveniently situated so that the stock can receive that regular attention which, especially under these conditions, they require for the attainment of success.

A further point to be noted is that the local demand for eggs is large, and prices are always extremely good. It is evident that, with the increased cost of production, due to the more complete equipment required, to the labour involved, and to the fact that all food must be provided, the average productiveness of the hens is of supreme importance. A rate of laying that would be profitable upon an ordinary farm, where poultry are included in the general stock, and find a considerable part of their food supply, would be inadequate when the fowls are kept in yards with very limited range. Without increase of fecundity, therefore, the margin of profit would be insufficient.

In view of the desirability of encouraging egg production in industrial areas, the Burnley example is of considerable value, and these laying competitions have exerted a wide influence.

For the purpose of the competition of 1913-14 the Society rented from the Burnley Corporation a small holding, three acres in extent, upon which was a house for the manager. The rent and rates for the year amounted to £42 13s. 7d., which appears to represent an average price for the district. Upon this site poultry houses and runs were erected; the cost of the plant was £360, which was met from the reserve funds of the Society. The number of members is 220.

The competition was arranged in four sections, namely:—

(1) *Small House Section*.—The ordinary small house was used in this section: 12 ft. by 8 ft. and 5 ft. 6 in. high at the eaves, rising to 8 ft. at the centre, with a run allowing 30 sq. yds. for each bird.

(2) *Semi-Intensive Section*.—A large flock was located in a house measuring 36 ft. by 15 ft. and 7 ft. high at the eaves, rising to 11 ft. in the centre, and allowing $3\frac{1}{2}$ sq. ft. of floor space for each bird. Outside was a run, divided into four sections for alternate use.

(3) *Local Section*: restricted to competitors within a radius of eight miles of Burnley, the houses used being similar to those in No. 1.

(4) *Dry Feeding Test*: in which were birds representing four noted laying strains.

Hitherto, in competitions held at Burnley and elsewhere, it has been customary for each lot of four or six birds to be separately housed. However necessary that arrangement may have been for the purposes of a competition, it could not be regarded as economic, either in respect of cost of equipment or of labour. As an example of the expense involved under the former head the Harper Adams Laying Competition may be cited; the capital expenditure for houses and runs was equal to £1 10s. 8d. per hen, and the annual charge for depreciation at 15 per cent., which is not excessive when the short life of wire netting is kept in view, was no less than 4s. 7d. per hen, or nearly two-thirds the food cost for the year. Such expenditure may be justified where sale of breeding stock is the main object, but can never be satisfactory for market egg production.

The Burnley competition is therefore of special interest in that, for the Small House Section, an arrangement has been adopted which more nearly approximates to the economic standard. Each of the houses used accommodated 24 birds, divided, however, by a latticed partition into two lots of 12 each. Perhaps this may have been desirable for special reasons, but in general operations it would not be necessary. On the other hand, the whole 156 birds in Section 2 were placed in the semi-intensive house, here again grouped in two lots, heavy and light breeds respectively.

As each competitor in the open sections was required to enter eight birds, four in the Small House Section, and four in the Semi-Intensive Section, comparisons between the two can be made, as each group can be regarded as equal, and feeding during the test was the same in both cases, together with scratching opportunity and space in open runs; the only differences to be noted are as regards the size of house and the number of inmates. For the reason that the Local Section was restricted to small houses the same comparisons cannot be made.

The Dry Feeding Test did not prove successful. For that purpose 16 birds were lent and housed together. The feeding consisted of equal parts of bran, biscuit meal, scraps, ground oats, and biscuit dust, with 10 per cent. of fish meal as a dry mash, and of equal parts of wheat, oats, cockle and kibbled maize, or broken barley mixed and given in an automatic feeder. The report states that "the birds never seemed to have the same bloom and vigour as the others, particularly during the winter months, and the manager had the greatest difficulty in keeping them in anything like a good hard condition." This does not confirm other experience, but the system may be more suited to birds with greater range.

In the figures given as to the results obtained, it is desirable to keep in view the fact that the number of birds of the respective breeds is very uneven. This fact may have considerable influence upon the place secured in the competition by any given breed. Without absolute uniformity of number of hens in each breed, absolute comparisons cannot be made. This does not, however, invalidate such comparisons as are made between the large and small houses. The following table shows the differences as to average number of eggs per hen and the money values:—

Average Eggs Laid and Values per Bird.

Breed.	No. of Pullets.	No. of Eggs.		Average Values.		Values, increases of.	
		Large House.	Small House.	Large House.	Small House.	Large House.	Small House.
				<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
White Wyandottes ..	48	174.62	192.35	16 10½	18 6½	—	1 7½
Buff Orpingtons	16	136.75	142.31	13 0	14 5½	—	1 5½
Buff Rocks ..	4	140.25	163.25	12 10	15 10½	—	3 0½
Rhode Island Reds ..	4	181.00	167.75	17 8½	17 2	0 6½	—
White Leghorns	68	166.30	166.94	15 10½	16 2	—	0 3½
Anconas ..	16	181.81	173.06	17 3½	17 1	0 2½	—
All Breeds ..	156	167.13	172.98	16 0	16 10	—	0 10
Heavy Breeds	72	164.65	178.25	15 10	17 5	—	1 7
Light Breeds	84	169.23	168.10	16 2	16 4	—	0 2

Whilst the differences are small in the aggregate (save in the possibly exceptional case of Buff Rocks), it is evident that the smaller flocks yielded a larger number of eggs in winter.

This is more apparent with heavy than light breeds, save in one case. So far as this test is concerned, therefore, there is no important advantage of one system over the other in some of the breeds, but in others the smaller house of 24 birds, more especially with heavy-bodied breeds, yielded the better result. That is the chief lesson of this competition. How far this is compensated for by greater cost of equipment and of labour requires further proof. One point should not be forgotten, namely, that the birds in competitions of this character are carefully selected and may be assumed to be bred from stock known to be highly fecund.

One of the most important problems presenting itself to poultry-keepers is the securing of a regular supply of eggs, and in this connection the figures afforded by this competition are interesting. Below are given the actual number of eggs laid per month and also the index numbers, taking the maximum month (March) as 100:—

<i>Months.</i>	<i>No. of Eggs per month.</i>		<i>Index Nos.</i>
October (1913-1914)	2,267	..	23.12
November	2,277	..	23.52
December	5,170	..	53.41
January	3,812	..	39.38
February	5,674	..	58.61
March	9,680	..	100.00
April	8,632	..	89.17
May	7,897	..	81.58
June	8,824	..	91.15
July	6,345	..	65.54
August	5,162	..	50.42
September	5,669	..	58.56

Of the 71,709 eggs produced during the twelve months, 13,526 (or 18.86 per cent.) were laid in the winter cycle, that is, October, November, December and January, this percentage being distinctly above the average.

The cost of food under such conditions must always be heavy. In this competition it worked out at 7s. 4d. per bird, though by October last feeding stuffs had not risen seriously. The value of eggs sold per bird was 19s. 3d., and the average price was 1s. 4½d. per dozen. No commercial poultry-keeper could hope to attain such a price save, perhaps, in such a district as Burnley. The rise in the price of eggs from early August doubtless contributed to this result, as nearly 13,000 were disposed of from 1st August to 14th October.

The ground occupied for this competition was fresh. A question arises as to how many years the soil can be stocked at the rate of 140 birds to the acre without becoming contaminated—a question of some difficulty where stock is kept and chickens

raised on the same ground. In this direction laying competitions generally afford no guidance, but some data may be available if the Burnley ground is occupied continuously for four or five years.

Of the 424 birds entered, 27 died, or 6·4 per cent. Counting the hens at 7s. 6d. each, these deaths on a commercial plant would have involved a loss of £10 2s. 6d. Any increase in these losses, in addition to depreciation in the value of stock, would become a serious annual charge.

The balance sheet of the competition shows a profit balance of £131 11s. 1½d. Entrance fees account for £94, and the prizes for £21 2s. Considering that wages amounted to £88 15s. 2d., it is evident that this competition offers encouragement to poultry-keeping on these lines if continuity can be attained.

HUSK OR HOOSE IN CALVES.

Husk or hoose is a parasitic disease of calves caused by the presence of small thread-like worms in the tubes of the lungs.

Life History.—The life history of the parasite has not been completely investigated. The eggs, and young worms which have been hatched out, are expelled by coughing and by the bowels after the phlegm from the lungs has been swallowed. The worms live for some time in water or moist soil and probably undergo changes outside the body which enable them to live and develop when they gain access to the system of a calf. It is not known how the parasite reaches the lungs, but possibly the immature forms (eggs and embryos) are swallowed with food or water, and are carried to the lungs by the blood stream. They develop into adult worms capable of producing young, and so give rise to a fresh crop of young worms. Although the actual cause of the disease is the parasite, external conditions favour its increase. Wet seasons (which favour the preservation of the immature forms), low-lying land, poor condition of the calves, and overstocking are all favourable to the spread of the disease.

Symptoms.—The symptoms depend to some extent on the degree of infection. The worms cause inflammation of the tubes of the lungs (bronchitis), and this results in a husky cough. Phlegm is coughed up, and in severe cases it may be mixed with blood; it often contains thread-like worms. In severe cases an animal may die suddenly of suffocation. Usually unthriftiness and a cough are the chief symptoms.

Treatment.—The treatment should be both (a) preventive, and (b) medicinal :—

- (a) If pastures are very badly contaminated it may be good policy to plough them up and crop the land. Calves should be given a liberal diet and should be kept from pastures on which infested animals have run, especially if the pastures have been overstocked or are naturally damp and undrained.
- (b) It is a popular belief that if volatile drugs, such as turpentine, are given by the mouth, the vapours are given off by the lungs, and exercise a poisonous effect on the parasites. While it is correct that the vapours of such drugs may be excreted by the lungs, the amount so excreted is never sufficient to affect parasites, and therefore treatment of this kind cannot be effective.

The injection of drugs into the windpipe, and fumigation by poisonous gases, give good results, but these methods should only be undertaken with the advice and under the supervision of a veterinary surgeon.

THE USE OF STRAW FOR FODDER.

THE following facts and suggestions have been compiled by the Animal Nutrition Institute, Cambridge, at the request of the Board of Agriculture and Fisheries, for the benefit of farmers who propose during the coming winter to extend the use of various kinds of straw for fodder.

In considering the value of any material for fodder the first point which arises is the composition as shown by analysis. Unfortunately for the present purpose, it is unusual in Great Britain to buy or sell any kind of straw for fodder. Consequently there has been little need of analysing straws from the point of view of their use as fodder, and very little information as to the composition of British-grown straws is available. The figures given in the ordinary text books and dictionaries are derived almost exclusively from German sources, and are of comparatively little practical use in the case of a substance like straw, the composition of which so obviously varies with date of cutting, methods of harvesting and thrashing, time of sowing, and so forth.

Back volumes of *The Journal of the Royal Agricultural Society* record analyses of most kinds of straw made by the late Dr. A. Voelcker, but methods of analysis have changed

so much since the date of these analyses that they can scarcely be considered as reliable now. In the case of oat straw a large number of samples were analysed quite recently by Aitken and Hendrick, whose results are recorded in the Transactions of the Highland and Agricultural Society. From these and a few other scattered analyses, together with a number of analyses made at Cambridge for the special purposes of this article, Table I. has been compiled, which gives British analyses of several kinds of straw, and German analyses only where no British figures are available. The analysis of average meadow hay is included in the table for purposes of comparison. The figures are all calculated on the basis of 14 per cent. of moisture, the standard average content of moisture in ordinary samples of all kinds of hay and straw as used for fodder. The time at our disposal did not admit of complete analyses, and, therefore, Voelcker's figures for fat have been adopted. No appreciable error can result from this, as the percentage of fat in all cases is very small, and the method of fat estimation is practically the same now as when Voelcker's analyses were made.

TABLE I.—*Composition of Different Straws.*

Description of Straw.	Protein N x 6.25	Fat.	Carbo- hydrates.	Fibre.	Ash.	Source of Analyses.
Wheat, winter ...	1.86	1.11	37.4	40.6	4.9	Cambridge.
Wheat, spring ...	2.03	1.11	40.5	38.5	3.7	Cambridge.
Barley, spring ...	3.89	1.16	38.0	39.7	4.2	Cambridge.
Oats, spring... ..	2.77	2.91	43.1	32.1	5.2	Aitken & Hendrick.
Rye, winter ...	3.11	1.39	37.3	40.0	3.9	German.
Rye, spring ...	3.16	1.56	41.7	36.9	2.6	German.
Bean, winter ...	4.74	1.09	29.4	45.8	4.8	Cambridge.
Bean, spring ...	5.97	1.09	27.4	45.2	6.1	Cambridge.
Bean, pods and cavings ...	10.10	—	41.4	29.2	5.4	Cambridge.
Pea ...	9.00	1.90	32.3	36.2	6.3	German.
Meadow Hay ...	9.50	2.30	40.3	27.6	6.0	Average.

The figures given in Table I. and the German figures of the text-books agree remarkably well, except in a few cases. For example, the German figures indicate that oat straw has about the same feeding value as barley straw. The British figures, however, give to oat straw an appreciably higher value than barley straw, a conclusion with which practical men will generally agree. Bean straw, on the other hand, appears to be flattered by the German figures, whilst German pea haulm does not appear to come up to the standard accepted in British practice, although it has not been possible

to find any reliable British figures in confirmation. The variations noted are probably due to difference in date of cutting, the inclusion of varying proportions of flag and stem according to the methods of harvesting and thrashing, and, no doubt, to the culture of different varieties. It should also be mentioned that each figure given in the table is the average of the analyses of several samples, which do not always agree very closely amongst themselves. It must be understood, therefore, that British straws of the same kind are not all of the exact composition given in the table. Considerable variations occur between one district and another, one variety and another, and so forth.

Farmers are getting accustomed to interpreting for themselves analyses of cakes and meals, which they commonly buy. In the case of these concentrated feeding stuffs, which contain little fibre, nearly all the constituents indicated by the analysis are digestible, and the analysis is consequently a fair measure of their feeding value. In the case of bulky foods like straws, however, where only about half the constituents shown by the analysis are capable of digestion, the figures of an ordinary analysis are likely to give quite a wrong impression of their relative value.

So far as can be found, no determinations of the digestibility of straws have been made in Great Britain, but by applying German digestibility figures to British analyses it has been possible to arrive at the figures given in the first four columns of Table II. From these figures the last four columns have been calculated.

TABLE II.—*Digestible Nutrients per 100 lb. Straw.*

Description of Straw.	Protein.		Carbohydrates.	Fibre.	Nutritive Ratio.	Starch Equivalents			Source of Information.
	1.	2.				Food Units.	For Maintenance.	For Production.	
	1.	2.	3.	4.	5.	6.	7.	8.	9.
Wheat, winter ..	0.30	0.40	13.9	19.9	1:11.5	35.5	35.0	11.2	Camb.
Wheat, spring ..	1.19	0.04	16.4	19.2	1: 30	38.7	37.2	14.5	Camb.
Barley, spring ..	0.67	0.48	17.0	21.5	1: 59	41.4	40.3	17.2	Camb.
Oat, spring ..	0.72	1.12	19.4	17.6	1: 54	41.6	40.7	21.9	Aitken & Hendrick.
Rye, winter ..	0.77	0.71	15.3	22.4	1: 51	41.4	40.1	16.8	German.
Rye, spring ..	1.01	0.82	20.0	20.3	1: 41	44.9	43.2	21.7	German.
Bean, winter ..	2.08	0.62	19.8	19.6	1: 20	40.1	43.7	16.5	Camb.
Bean, spring ..	2.72	0.62	18.6	19.4	1: 15	40.4	42.6	17.1	Camb.
Bean, pods and cavings..	5.05	0.62	27.5	12.5	1: 8	54.2	47.5	29.3	Camb.
Pea ..	5.10	1.18	17.2	11.4	1: 6	44.3	37.4	11.7	German.
Meadow Hay ..	5.42	1.17	25.8	16.3	1: 8	58.6	51.8	33.1	Average.

The figures in the last four columns require some explanation. Column 5 gives the nutritive ratios of the different straws. The nutritive ratio shows the relative proportions of protein

(or flesh-formers) to carbohydrates and fats (or heat-formers). For instance, the ratio 1:115 assigned to wheat straw means that in this fodder there are 115 lb. of carbohydrates and fats for every 1 lb. of protein. It will be noted that the ratios in the table vary from 1:115 to 1:6. The ratio required by most animals is somewhere between 1:5 and 1:10 according to the age of the animal and the purpose for which it is being fed.

For comparison with the figures given in "Notes on Feeding Stuffs" which appear in this *Journal* each month, the food units contained in each variety of straw are given in column 6. These figures are, however, not instructive as applied to straw, since they are calculated on a basis which includes an allowance for the manurial value. This is fair as between the buyer and seller of cakes and other concentrated foods, but does not apply to the case of bulky materials like straw, which are not sold for fodder to any appreciable extent. Farmers know well enough the manurial value of their straw. What they want to know is the food value.

The figures in columns 7 and 8, headed "starch equivalents," express the relative feeding values of different kinds of straw, without any allowance for manurial value. The figures give the number of pounds of starch which have the same feeding value as 100 lb. of the fodder, starch being always taken as the unit of comparison in valuing foods. It is necessary to calculate two starch equivalents for each fodder, because in most cases the food an animal eats has to perform two functions:—(1) some of it is used to keep the body warm and to provide the energy for the ordinary vital functions, food used in this way being said to be for "maintenance"; (2) some food is eaten above that required for maintenance, and is used by the animal for "production" of growth, fat, milk or work. The whole of the energy of the digestible portions of the food is available for "maintenance," and the starch-equivalents of straws for this purpose are comparatively high. For example, the figures in column 7 show that for maintenance 100 lb. of wheat straw are equal to about 35 lb. of starch, 100 lb. of barley straw are equal to about 40 lb. of starch, and so on. Straws are, therefore, suitable materials for that portion of the diet which is concerned with the maintenance of the animal.

It is noteworthy that the figures showing the starch equivalents for "production" in column 8 are much smaller. Thus for the production of meat, milk, or work, 100 lb. of wheat straw are equal to not more than about 11 lb. of starch, or rather

less than one-third as much as the starch-equivalent for maintenance. The reason of this is that straws are very bulky foods, containing comparatively small amounts of digestible nutrients combined with large quantities of indigestible fibre. The work of chewing and digesting such bulky fibrous material uses up something like two-thirds of the energy of the nutrients which are digested, and thus only one-third is left over for production of growth, milk, meat, or work. Although this energy used in digestion is no good for production, it is as good as any other energy for keeping the body warm. The low figures in column 8 may be taken as proof that straws are of little use for productive purposes. Their proper use is to help to make up the maintenance portion of the ration, the productive portion being made up of other foods which are more concentrated and more digestible. Thus straw will maintain the weight of a runt during the winter, but no amount of straw will fatten him.

Wheat straw, as shown by the figures for starch equivalents, has the lowest feeding value of any of the materials included in the list of straws. Its stiff and elastic nature also makes it less palatable than other straws, but these very properties cause it to absorb liquids more effectively, and make it the best of all straws for litter.

Barley straw has considerably greater feeding value than wheat straw, and, excepting the awns, is more palatable. Its softness and lack of elasticity make it a less effective absorbent of liquids, and it is therefore not so good for litter.

Oat straw is more palatable and more readily eaten by stock of all kinds than any other cereal straw. Consequently, little of it is used for litter. It has about the same value for maintenance as barley straw, but its *value for production is considerably higher*; hence it is better than other straws for growing animals.

Rye is little grown in Great Britain, and it has not been possible to find any analyses of British-grown rye straw. Most of the small quantity grown in this country is used for packing purposes.

Bean straw differs from the cereal straws in the much higher content of protein, as will be seen from its nutritive ratio. The softer and more brittle portions included in the cavings have a still higher food value, approximating to that of average meadow hay.

Pea haulm has the reputation amongst practical men of being equal in value to hay. The German figures quoted in the tables do not bear out this opinion, and no British analyses which appear to be trustworthy are available.

Practical men hold various opinions of the food value of bean and pea straw. When the whole of the straw is chaffed the food value is low because the woody stems decrease the digestibility, but where the stock are allowed to pick out the leaves and pods, and discard the stems, the food value of what is picked out is about that of hay, as shown by the analysis quoted of pods and cavings.

Increasing Palatability and Digestibility.—As shown by the analyses quoted in the table, all the straws contain large quantities of nutrients, but, on account of their unpalatableness and low digestibility, only a comparatively small proportion of the nutrients is of use to the animal. Many suggestions have been made for increasing the palatableness of straws and making them more digestible. The former object is sometimes achieved by chaffing the straw and mixing it with pulped or cut roots in the proportion of 1 part by weight of chaff to 9 parts by weight of roots. The mixture is allowed to stand for at least 12 hours before it is fed to the stock. As the season advances and the straw and the roots get drier, the mixture may be moistened with treacle mixed with warm water and sprayed on with a watering can. The straw on standing in contact with the roots absorbs water from them, and the fermentation which results warms the mixture and softens the straw. No doubt, this treatment makes the straw more palatable, but so far as it has been possible to ascertain there is no evidence that its digestibility is increased.

For horses getting all their bulky food in the form of straw it is good practice to allow the horse-keeper about half a stone of linseed cake per horse per week. This is mashed in a tub with water. When the cake is thoroughly softened it is stirred up, and the liquid used to moisten the chaff. This mixture is readily eaten, and gives good results.

Another time-honoured method is to sandwich layers of cut green stuff amongst the chaff when it is put in the chaff house. The amount of green stuff used is small. Late cuttings of seeds, lucerne, or almost any late green stuff, will answer the purpose. The mixture is solidified by the feet of the men who spread out the cut green stuff, and a slow fermentation results. After standing some weeks or months the mixture develops a pleasant smell and is readily eaten by any kind of stock.

Steaming is also sometimes resorted to. This, no doubt, softens the straw, but there appears to be no definite evidence that it increases the digestibility. The digestibility, however, is undoubtedly increased by boiling with alkali, but such

treatment is beyond the resources of the ordinary farmer. It is possible that all the processes in which fermentation is set up may increase the digestibility. This question is now under investigation.

Attention has already been directed to the great variation in the feeding value of different parts of straw. Although no analyses can be quoted to prove the point, there can be little doubt that the leafy portions of straw are more palatable, more digestible, and consequently of greater feeding value than the stems. This knowledge can be turned to practical account in two ways. In the first place the threshing machine, to a certain extent, separates these two parts of the straw. The softer, leafy portions are broken in their passage through the machine, and delivered separately in the form of what is usually called cavings, which should be carefully preserved and used in place of hay. Such cavings are undoubtedly of greater feeding value than the straw proper. This statement applies only to the broken leafy parts of the straw and not to the husks of the grain which, especially in the case of barley awns, are apt to irritate the eyes of stock.

Cavings are particularly valuable in cases where clover or other seeds were sown with the corn. In such cases the cavings contain nearly all the leaf of the "seeds," and their value will consequently be nearly that of good hay.

Separation is readily made by the animals if the method of giving long straw is adopted. In this method nearly the whole allowance of straw intended for both food and litter is placed in racks or bings. The animals pick out much of the softer, leafy parts, and strew the hard, stemmy portions under their feet. The small amount which was kept back is then spread by the attendant.

In cases where the supply of straw is so short that it does not suffice for both fodder and litter, the whole of it may be used for fodder, a substitute being used for litter. Very fair litter may be made by using dried bracken where this is available. In other cases peat-moss litter is invaluable, and may at the present time be bought in large quantities at something under £2 per ton. With care, 1 ton of peat moss will replace from 2 to 3 tons of straw. Where it is necessary to use all the straw for fodder it is advisable to adopt one or other of the methods suggested above for increasing its palatability.

Rations.—The following rations are given as instances of the practical application of the suggestions made above :—

Horses.—Where the supply of hay is short the following rations should be tried, per head per day :

Oat straw, long, in racks 10 to 12 lb.

Chaff or cavings 8 „ 10 „

If any hay at all is available the chaff should be mixed hay and straw, half and half. If no hay can be spared, the straw chaff should be moistened before it is used with a mash of linseed cake and water at the rate of about 1 lb. of cake per head per day. At the present high price of linseed cake it is tempting to suggest that rice meal should be used in its place, choosing, of course, a sample rich in oil. The writers have no personal experience of such use of rice meal, but know of cases where it has proved successful, and see no reason why it should not be satisfactory. Rations for horse corn are given in the monthly notes on feeding stuffs on p. 680.

Cows or other Horned Stock.—Where these are kept in boxes or yards they should be given long straw in their bings or racks at the rate of about 25 lb. per head per day. From this they will pick out what they require of the more palatable and digestible portions and strew the rest under their feet for litter. Cows or bullocks do well on long barley straw fed in this way. They should also get cavings in place of hay, or chaff mixed the day before use with about 9 or 10 times its weight of cut or pulped roots. Where roots are short, or towards the end of the season when they get drier, owing to storing, half the proportion of roots may be used, the chaff being damped with a mixture of warm water and treacle.

ON 28th September an appeal in the following terms was made by the President of the Board of Agriculture and

Fisheries to farmers and occupiers of land in England and Wales :—

**Appeal by Lord
Selborne to the
Farmers and
Occupiers of Land
in England and
Wales.**

As Minister of Agriculture in this present time of War, I desire to appeal to you who live by the land to assist your King and Country by producing as much food as possible on your holdings

in the coming year. It is always a wise precaution for a nation at war to provide as much food as it can within its own borders. You must remember that this war has to be fought with money as well as men, and every additional pound's worth of food which you can grow means a reduction in the quantity to be purchased from abroad and is, therefore, a direct contribution to victory.

The chief needs of the nation are more wheat, meat, milk, oats, potatoes, bacon, and cheese. I cannot hold out any hope of a special financial inducement from the State ; on the other hand I do not ask you to do anything which would diminish the capital necessary to enable you to farm well, but, subject to this reservation, I ask you to do your part in producing larger quantities of the commodities mentioned above as the special war service which you can render to your country. I invite also, all market gardeners, cottagers, and allotments holders to do their share by increasing the production of vegetables, pigs, and poultry, and by living on the produce from their gardens and allotments as far as possible. By this means they will save money for themselves and increase the amount of food available for others.

The conditions of farming vary so much in the different localities that I cannot attempt to make any general recommendation for your guidance as to the means you should adopt for increasing the production of food on your holding. That must be left to your judgment and to the advice of your friends and neighbours. But I suggest that you should consider whether you cannot attain the object in view by one or more of the following methods :—

- (a) By ploughing up those of your poorest permanent grass fields which are suitable for conversion, and so increasing your arable land.
- (b) By shortening the period for which your existing arable land is kept under clover or rotation grasses.
- (c) By improving your remaining grass land so that it will carry more stock.
- (d) By reducing your acreage of bare fallow wherever possible.

I realise that increased production cannot be obtained without a great effort, and that farmers have to face many special difficulties in these times. It is my desire to help you to overcome these difficulties by all the means in my power.

The chief one which now confronts you is that of labour, and in this connection I have arranged with Lord Kitchener that, as soon as the analysis of the National Register has been completed, men of the classes of Working Farm Bailiffs, Shepherds, Stockmen (including Milkers), Horsemen, Thatchers, Engine Drivers, and Mechanics and attendants on agricultural machinery, steam ploughs and threshing machines will not be accepted for enlistment, even if they should offer themselves.

This valuable concession will enable you to retain the services of your skilled workers, upon whom I desire to impress that they are serving their country best by remaining at their accustomed occupations. But the difficulty will still remain in respect of the supply of ordinary farm labour. The staff of the Board of Agriculture are ready to assist you as far as possible, but they cannot cover the whole country, and in order to help you in respect of the supply of labour and of any other difficulties which may arise, I have asked the County Councils to assist the Board of Agriculture, and they have willingly agreed to do so. Steps are being taken for the appointment in each County of a War Agricultural Committee, representative of all the agricultural interests of the County, and for the appointment of local Committees in each District. I ask you to consult these local Committees on any problems and difficulties which may confront you. They will consist of your neighbours and friends who know the local conditions; and in many cases they will be able to assist and advise you. If they cannot do so, they will refer to the County Committee which will have at its disposal the services of the County staff for agricultural instruction and of the experts connected with the Provincial Councils for Agricultural Education, and which will be in touch with all the available sources of the supply of labour. The County Committee will be assisted by a representative of the Board of Agriculture and will report any special difficulties to the Board.

By means of this machinery it will be possible for me, as Minister of Agriculture, to be kept informed of the needs of farmers throughout the country, and to secure that all the help that can be given to you is placed at your disposal.

I ask you for your part to devote all your energies to the task that is set before you, and I am confident that I shall not ask in vain.

A COMPREHENSIVE review of the world's supply of potash is made in a pamphlet issued by the Imperial Institute (*The World's Supply of Potash*, price 1s., post free). The supplies of potash from deposits of soluble potash minerals, salt lakes and brines, sea-water, vegetable sources, wool washings, nitre-earths, and insoluble potash minerals are in turn considered.

Besides those worked at Stassfurt there are *deposits of soluble potash minerals* in Alsace, in Austria, in the Punjab, at two places in Chile, and in Catalonia (Spain), the Catalonia deposits

offering one of the most promising fields for the supply of potash minerals that have been recorded for many years past.

Lake basins containing potash are found in the United States, but in only a few cases have potash salts been located in quantity likely to repay working. One of the most promising is Searles Lake, California, which, it is estimated, may yield from four to six million tons of potassium chloride. No potash salts have so far been produced from the salt lakes or brines in India.

With regard to *sea-water*, which contains on the average about 0.25 per cent. of potash salts, it is thought that at the present time it might pay to recover potash from residues usually run back into the sea at large works for the recovery of salt from sea-water such as exist in France, Portugal, the United States, and India. It has recently been stated that the total output of potash salts from sea-water is about 2,000 tons per annum. The cost of production is stated to be, in the United States, about 13s. per ton of potash salt produced by means of a direct extraction process.

Seaweed is the only vegetable source of potash promising to become a formidable competitor with the mineral sources. Besides being used raw as a manure (see Leaflet No. 254) potash is obtained from burnt weed (kelp) in Scotland, Ireland, Norway, Japan, and the United States. In the last-named country it is estimated that six million tons of potassium chloride per annum could be obtained from the giant algae of the Pacific Coast (which are said to contain five times as much potash as ordinary species of seaweed). The cost per ton of weed landed averages 10d.

There are two methods of using this Pacific Coast seaweed :—

(1) After drying, the residue is ground and used as a potash and nitrogenous manure. Heating up to 100° C. gives a good manurial product, but a still better is obtained if the heating is continued to 200° C. Dried at 105° C., the *Nereocystis* weed contains, on the average, 19 per cent. of potash, 2 per cent. of nitrogen, and 47 per cent. of organic matter; 500 tons of wet weed produce 75 tons of dry, and 1 ton of dry weed costs about 20s. 6d. to produce. On the basis of only 15 per cent. of potash and 2 per cent. of nitrogen, then with potash at 10s. 5d. a unit and nitrogen at 2s. 8d. a unit, the material should be worth 61s. 6d. a ton. It is suggested that this material could replace efficiently much of the low-grade potash salts now employed as manure.

(2) The weed is used as a source of potash salts, the other by-products being recovered at the same time. By these processes 100 tons of wet weed give 11,000 lb. of potassium chloride, 7,680 lb. of manure salts, and 400 lb. of calcium carbonate, besides other by-products.

Owing to its very low content of potash, large quantities of *wood ash* are necessary for the production of appreciable quantities of potash, and the production of potash from this source is only remunerative where large quantities of waste wood are available, or where much is used as fuel and the ashes are easily collected. In most cases the only use for the ash from saw-mill burners is its employment directly on the land by farmers in the locality.

As regards *vegetable waste* the use of hedge clippings and trimmings has been dealt with in this *Journal* (Nov., 1914, p. 694). It appears that some 7,000 tons of crude potash from sunflower stalks were exported from Russia in 1913. Potash is also obtained from the residues from sugar beet manufacture ("vinasse").

The sweat from raw *wool washings* contains potash which can be removed by treating with water. In the United States wool washings are run through peat which absorbs the potash, and processes are in operation in Belgium, France and Germany for obtaining the potash from the washings. The annual production of potash from this source is from 5,000 to 10,000 tons of potash as K_2O ; in the Roubaix district of France alone, potash salts to the value of £100,000 are annually obtained in this way.

Nitre-earths are found in the soils of old village sites in India, Egypt, Persia, Hungary, Italy and Poland, but India is the only country from which large quantities of potassium nitrate obtained from this source are exported, 14,157 tons, to the value of £233,000, being exported in 1914.

Of *insoluble potash minerals* probably one of the most promising is alunite, which is found in Italy, Australia, India, Canada and the United States, the supplies in the last-named country containing as much as 10.46 per cent. of potash as K_2O . Various methods of treatment are being carried out. Calafatite, found in Spain, contains 9.64 per cent. of potash as K_2O . Large quantities of feldspars are available at low prices, so that considerable attention has been directed to converting the insoluble potash present into a soluble form, several processes being tested at the present

time ; no considerable quantity of potash has, however, yet been produced from this source and the processes do not seem capable of competing, under normal conditions, with salts from the Stassfurt deposits.

During the past few years attention has been directed towards the possibility of employing as manures, with or without previous treatment, minerals and rocks which contain potash insoluble in water. The more important of these are alunite, feldspar and leucite. As a general rule, however, it may be concluded that their employment is not likely to prove remunerative unless the material is available in large quantity at a low price. Even under these conditions its use may not prove satisfactory. The manuring of land with insoluble potash minerals has the advantage, however, over the use of kainit and similar compounds, that the valuable constituent only becomes "available" slowly, and is, therefore, not washed out of the soil. Minerals containing insoluble potash are employed as manures in Italy, Austria, Russia and Germany.

IN view of the fact that farmers, for convenience and other reasons, frequently have recourse to "special" or compound manures supplying in greater or less degree most or all of the food constituents required by plants, a list of simple mixtures is given below which, under present conditions, might be used for the different farm crops. Such general mixtures, however, will probably be neither the cheapest nor the most suitable in exceptional circumstances, and must be used with discretion. The total quantities stated should be sufficient for one acre under average conditions.

**Compound
Manures.**

Other manures can be mixed together to give approximately the same composite analyses, but only such as do not interact on each other chemically should be used for this purpose.

In each case the percentage composition of the mixture has been ascertained by multiplying the weight (in cwt.) of each manure by its content of nitrogen or phosphate, as the case may be, and dividing by the total weight of the mixture. (See example below.)

In making these mixtures the several ingredients should be very thoroughly incorporated in small quantities, and used without undue delay.

The manures used are *Sulphate of Ammonia* containing 20 per cent. of nitrogen, *Superphosphate* containing 30 per cent. of soluble phosphate, and *Steamed Bone Flour* containing 1 per cent. of nitrogen and 60 per cent. of insoluble phosphate. It is assumed that potash in the form of kainit, sulphate, or muriate of potash is unobtainable, or, at all events, is too expensive for general use.

Wheat, Oats, Barley.—

		Per cent.
$\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = $\frac{1}{2} \times 20 \times \frac{8}{25} = 4.8$
2 „ Superphosphate		Sol. Phos. = $2 \times 30 \times \frac{8}{25} = 19.2$
$\frac{3}{4}$ „ Steamed Bone Flour		Nitrogen = $\frac{3}{4} \times 1 \times \frac{8}{25} = .1$
		Insol. Phos. = $\frac{3}{4} \times 60 \times \frac{8}{25} = 7.2$

The analysis of the mixture is, therefore:—4.9 Nitrogen; 19.2 Soluble Phosphate; and 7.2 Insoluble Phosphate.

Mangolds.—

		Per cent.
$1\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = 6.1
3 „ Superphosphate ..		Sol. Phos. = 18
$\frac{1}{2}$ „ Steamed Bone Flour		Insol. Phos. = 6

Swedes, Turnips.—

		Per cent.
$\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = 3.4
3 „ Superphosphate ..		Sol. Phos. = 19
1 „ Steamed Bone Flour		Insol. Phos. = 12.6

Potatoes, Carrots.—

		Per cent.
$1\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = 4.3
4 „ Superphosphate		Sol. Phos. = 20
$\frac{1}{2}$ „ Steamed Bone Flour		Insol. Phos. = 7.5

Beans, Peas, Lucerne, Sainfoin. —

		Per cent.
$\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = 2.0
4 „ Superphosphate		Sol. Phos. = 21.8
1 „ Steamed Bone Flour		Insol. Phos. = 11

“Seeds” Hay.—As for Oats.

Meadow Hay.—

		Per cent.
1 cwt. Sulphate of Ammonia	containing	Nitrogen = 4.5
3 „ Superphosphate		Sol. Phos. = 20
$\frac{1}{2}$ „ Steamed Bone Flour		Insol. Phos. = 6.7

Pastures.—

		Per cent.
$\frac{1}{2}$ cwt. Sulphate of Ammonia	containing	Nitrogen = 2.1
4 „ Superphosphate		Sol. Phos. = 24
$\frac{1}{2}$ „ Steamed Bone Flour		Insol. Phos. = 6

AN increase in the production of cheese is recommended both because of the present high prices and also as a contribution to the national food supply.

**The Importance
of Producing
More Cheese.**

Cheese is the form in which milk can best be preserved as a food; it is particularly suitable in a diet on which prolonged physical work has to be performed; and it is a very good substitute for meat.

Most of the present methods of using milk give rise to avoidable waste.

1. *Milk Selling*.—As a result of imperfect organisation among farmers, milk which is in excess of what is required to fulfil the farmer's sale contract is often put to a comparatively unprofitable use. Even if the individual farmer did not himself undertake cheese-making, co-operative depots might enable large quantities of surplus milk to be converted into cheese during the "flush" season (May and June) and thus add to the food supply.

2. *Butter-making*.—Under present conditions the use of large quantities of milk for the production of butter is wasteful, since wholesome and economical substitutes for butter are available, and butter represents less than half the food in the milk required for its manufacture. Further, the replacement of butter by cheese would be profitable, as a consideration of the following fairly typical example will show:—

	s.	d.
2½ gal. milk produce 2½ lb. Cheese at 10d.	2	1
2½ " " " 1 lb. Butter at 1s. 2d.	1	2
Profit in favour of cheese over butter	0	11
Less the greater value of the by-products from butter over cheese manufacture	0	3
Net profit	0	8

or, say 3d. per gal. of milk.

3. *Calf Rearing*.—The use of whole milk for calf rearing is to a large extent wasteful, since experiments have shown that early in the calf's life (say, from about the third week) whole milk may be gradually replaced by substitutes. Information as to the use of milk substitutes in calf rearing is given in Leaflet No. 142 (*Calf Rearing*).

Type of Cheese to Make.

The kind of cheese to be made is dependent principally on the amount of milk available, and the local markets. With a surplus of from 15 to 20 gal. and upwards available daily for cheese-making, a wide range as to the kind of cheese is possible, but the following varieties are especially recommended :—

<i>Quantity of Milk available.</i>	<i>Kind of Cheese.</i>
15-20 gal.	.. Caerphilly, Single Gloucester.
20-40 „	.. Derby, Double Gloucester, Truckle Cheddar.
over 40 gal.	.. Cheddar, Cheshire, Leicester, Lancashire, Derby.

Where under 15 gal. are available daily, cheese-making will be restricted either to hard cheeses of the type sometimes described as “Small Holder” cheeses or to soft cheeses. The manufacture of the latter kind, however, is advisable only in localities where a ready market is available, since soft cheese does not keep well. “Small Holder” cheeses are superior in this respect, and, if properly made, can be kept in a saleable condition for a considerable time.

Notes on the manufacture of soft cheeses are given in Leaflet No. 179, and on hard cheeses suited for producers of small quantities of milk in Leaflet No. 231. (As to the latter an article in the *Journal* for June, 1911, p. 193, on the “Kingston” cheese for small holders, may also be consulted.)

The cost of cheese-making apparatus may be as low as £1 in the case of small hard or soft cheeses ; but for the manufacture of the larger types of cheese an outlay of from £15 to £30, or even more in the case of large dairies, becomes necessary.

Most county education authorities provide instruction in cheese-making, and are prepared to give cheese makers all possible advice and assistance (see also Special Leaflet No. 25, *Technical Advice for Farmers*).

THE following note has been communicated to the Board by Mr. G. C. Sankey :—

In some districts it has been the custom for many years past to move poultry on to the stubbles directly the corn has been carried. Where the necessary precautions are taken the practice has proved very successful and it might with advantage be more widely adopted, especially now that the increased price of feeding stuffs renders any economy in feeding a matter of importance.

Poultry thrive best on the wheat stubbles; they do not always take readily to the oat and barley stubbles unless they have been accustomed to these grains previously. The most satisfactory course is to put the birds on to the latter stubbles first; if they do not at once relish the grain they will wander over a greater range and scratch in the hope of finding more attractive food, and in this way will destroy a large number of grubs.

The chief difficulties met with in keeping poultry on the stubbles are (1) the unsuitability of the average farm poultry-house for the purpose, and (2) the danger of foxes.

The house should be a portable one. It should be made in sections of strong $\frac{3}{4}$ -in. seasoned match-board, and ample ventilation should be provided; a convenient size is 8 ft. by 6 ft. The body should be mounted on wheels of not less than 12 in. diameter and possessing broad rims to prevent them sinking into the ground in wet weather. In moving the houses the traces are best attached to the axle itself and not to hooks placed on the front of the house. The house should be placed on a high but not exposed position and never near a wood or thick hedge that is likely to harbour vermin such as foxes and stoats.

Perhaps the greatest drawback to keeping poultry on stubbles is the danger of loss by foxes. There seems to be no effective means of keeping these pests away, and the only course is to take all precautions that are possible. The house should always be closed up at dusk and the fowls should not be allowed out in the morning until the dew is off the field. Wire netting is usually effective, but there is always the possibility that the fox will get over or under it. It has been suggested that pieces of tarred felt placed round the house and a light inside the house would keep foxes away, but the writer has not found these measures of much use. Special precautions should be taken when there is any pheasant shooting in the neighbourhood, as when a fox is disturbed by the beaters it will often roam about for two or three days before returning.

Pullets, unless hatched very late, should never be put on the stubbles; the abundance of food they obtain there forces them on too rapidly, with the result that they commence to lay a month or six weeks sooner than they ought to, and after laying about 25 to 30 eggs they stop and will not as a rule start again until the spring when eggs are plentiful. The most suitable birds to be put on the stubbles are growing cockerels and hens that have been sitting and are consequently in poor condition.

The first day the fowls are put on the stubbles they should not be allowed out until about an hour before dusk, otherwise difficulty will be experienced in getting them into the house again. After the first day, the time that the birds are allowed out must be determined by the farmer. This is best done by feeling their crops in the evening. As the ground becomes stale the house should be moved, care being taken that it always faces south. A plentiful supply of water, which should be left in a shady place and should be renewed daily, must always be provided.

WHEN these notes* were begun six months ago they were prefaced by an introduction setting out the general principles of feeding. After the lapse of this time,

**Notes on Feeding
Stuffs in October:**

*From the
Animal Nutrition
Institute, Cambridge
University.*

and especially as the approach of winter entails different conditions of feeding, it may not be out of place to refer once more to general principles. The following remarks are intended to make clear several points bearing on the purchase and use of feeding stuffs, six months' experience in preparing these notes having shown them to be frequently misunderstood.

In order to purchase feeding stuffs to the best advantage it is necessary to know exactly what one requires to buy. The first step in obtaining this knowledge is to understand the composition of the common home-grown fodders which are usually available on any farm where stock are kept. The following table gives the percentage of digestible nutrients in the common home-grown fodders :—

Name of Fodder.	Digestible Nutrients per Cent.				Nutritive Ratio.
	Protein.	Fat.	Carbo-hydrates.	Fibre.	
Meadow hay	4·65	1·01	22·2	14·0	1 : 8
Oat straw	0·77	1·14	19·8	18·0	1 : 52
Barley straw	0·67	0·48	17·0	21·5	1 : 59
Wheat straw	0·30	0·40	13·9	19·9	1 : 115
Bean straw	2·72	0·62	18·6	19·4	1 : 15
Turnips	0·1	0·1	5·6	0·5	1 : 63
Swedes	0·2	0·1	7·1	0·6	1 : 40
Mangolds	0·15	0·1	8·5	0·5	1 : 60

The figures in the above table give the number of pounds of each kind of digestible nutrient in 100 lb. of each kind of fodder. They convey a good deal of useful information to anyone who understands the fundamental principles of

* This *Journal*, April, 1915, p. 52.

nutrition. For the sake of readers who do not understand these principles a few lines of information may be of value.

Digestible Nutrients.—This term is very generally misunderstood. When an ordinary article of human food, is described as digestible most people take the description to mean that it may be eaten without causing the particular kind of discomfort which is called indigestion. Similarly an article of food which gives rise to discomfort after it is eaten is said to be indigestible. The digestive arrangements of farm animals are very different from those of human beings, and the meaning of the term digestible as applied to foods for animals is not the same as that indicated above. To understand the meaning of the term as used in reference to the feeding of animals it must first be recognised that only that part of the food which is digested is of any service to an animal. The amount of digestible nutrients in any food is found by feeding an animal on a known weight of the food for a week or even a fortnight. During this period the animal's dung is carefully collected and weighed. Both the food and the dung are then analysed, and by subtracting the amounts of the various nutrients voided in the dung from the total amounts eaten in the food the amount of each nutrient which has been digested is found. The figures given in the table were ascertained in this manner.

Nutrients.—Only certain constituents of foods are of service to the animal, namely, proteins, fats, carbohydrates, and ash. These constituents are known as nutrients. They are described below.

Proteins.—The working parts of the body of an animal, namely, the muscles (lean meat), nerves, glands, and so on, are made of proteins. Like any other things which do work they undergo wear and tear in the process, and this wear and tear must be replaced from day to day. For this purpose proteins must be supplied in the food, or the animal loses weight and its health suffers. No other nutrient can take the place of protein for this purpose. It is just as reasonable to attempt to repair the bearings of a steam engine with a piece of coal as to try to make good the wear and tear of the muscles of an animal by feeding it on fat or sugar. It must also be remembered that in young animals where growth is taking place the working parts are increasing, and for this a liberal supply of proteins in the diet is necessary. An extra supply of proteins is also required for pregnant animals, or animals giving milk, for in both cases the mothers have

to supply large quantities of proteins for the growth of their young.

Fats or Oils are perhaps more familiar to most people than proteins. They are useless for repairing the working parts of the body, or for providing material for the growth of the muscles of young animals. They have nevertheless a very high feeding value because the animal can utilise them in its body for providing heat and work. If an animal eats more fat than is necessary to keep it warm, and to carry on its vital functions, such as breathing, heart beat, and mastication, the balance can be stored up as fat.

Carbohydrates include such well-known substances as sugar, starch, and digestible fibre. Like the fats, they are useless for repairing the working parts of the body, and, again like the fats, they can produce in the body heat and work. If the diet supplies more carbohydrates and fats than are necessary for keeping the animal warm, and providing the energy for carrying on its usual vital functions, the balance can be used by the body for the production of increased weight in the form of fat, for the provision of the sugar and fat in milk, or for enabling the animal to pull a load, or to do any other work which may be required of it.

It is a common practice to call the proteins "flesh formers" and the fats and carbohydrates "heat formers."

Ash.—Most fodders contain all the ash needed by animals, but there are a few cases in which the exclusive use of one fodder only in the diet may cause trouble. For example, both maize and rice meal are deficient in those particular constituents of the ash which are required for the formation of bone. Cases not infrequently arise of leg bones breaking in pigs fed on these foods only. The addition of a small proportion of bone ash, or of another food rich in ash, such as skim milk, linseed cake, or coconut cake, prevents such trouble arising.

Nutritive Ratio.—The importance of proteins in nutrition, and the impossibility of replacing them by any other nutrient, has already been insisted on. For this reason it is important to know the relative proportion of proteins in different foods, and this is expressed by the nutritive ratio which gives the relative proportions of proteins to carbohydrates and fats, or, in other words, the relative proportions of "flesh formers" and "heat formers" in the food. In calculating the ratio, it must be remembered that 1 lb. of fat produces as much heat or work in the body as about $2\frac{1}{2}$ lb. of carbohydrates—such as starch or sugar. The rule for the calculation of the

nutritive ratio of any food is to multiply the percentage of digestible fat by $2\frac{1}{2}$, add the product to the percentages of digestible carbohydrates and digestible fibre, and divide the total sum by the percentage of digestible proteins.

Referring back to the table on p. 1 the statement that the nutritive ratio of meadow hay is 1 : 8 means that, for every pound of digestible proteins present in the hay, there are 8 lb. of digestible fat, carbohydrates, and fibre, reckoned as above. The nutritive ratio required by animals varies from about 1 : 5 to about 1 : 10, according to circumstances, so that meadow hay is a fairly well-balanced food for most purposes. The nutritive ratios of the other fodders included in the list are very much wider, from which it follows that they should be supplemented by the purchase of foods rich in protein, that is to say, foods with narrow nutritive ratios. The table on p. 680 also shows that most home-grown fodders are bulky, containing either much fibre or much water, and that at the same time they are deficient in fat. Foods bought to supplement them should, therefore, be concentrated (that is to say, they should contain little fibre or water) and be fairly rich in fat. Cakes made from oilseed residues best answer these requirements.

It is highly desirable that everyone who has to direct the feeding of stock should grasp these ideas. A proper understanding of the term nutritive ratio will prevent feeders from falling into such common errors as feeding pigs on coconut cake, replacing linseed cake by maize, or thinking that sugar beet slices can replace oats for horse feed.

Food Units.—This is the last term which requires explanation. Having set out the principles on which foods should be bought it remains to decide how the value of purchased foods should be assessed. For this purpose it is necessary to understand the term food units. It has been pointed out above that digestible fats, carbohydrates and fibre all play the same part in the body, *i.e.*, the production of heat and work, and that for this purpose 1 lb. of fat is as good as $2\frac{1}{2}$ lb. of carbohydrates or digestible fibre. It is, therefore, easy to reduce all these to one common denominator by simply multiplying the percentage of digestible fat by $2\frac{1}{2}$ and adding the product to the sum of the digestible carbohydrates and fibre. In order to value on the unit system, however, it is necessary to reduce the proteins also to the same denominator. From the scientific point of view this cannot be done, for proteins are required for a special purpose which carbohydrates and fats cannot fulfil. From the money point of view, however,

Feeding Stuff.	Reckoned from digestible nutrients.		Approximate prices per ton at the end of September.				Approximate prices per Food Unit.			
	Nutritive Ratio.	Food Units.	London.		Liverpool.		Hull.		Bristol.	
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Soya Bean Cake ..	1:1:1	132.3	9 0 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0
Decorticated Cotton Cake ..	1:1:1	123.3	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
Indian Linseed Cake ..	1:1:1	123.1	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
English Linseed Cake ..	1:1:1	120.1	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
English Linseed Cake ..	1:1:1	119.9	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
Egyptian Cotton Cake ..	1:1:1	102.6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6
Coconut Cake ..	1:1:1	83.5	4 9 0	4 9 0	4 9 0	4 9 0	4 9 0	4 9 0	4 9 0	4 9 0
Palm-nut Kernel Cake ..	1:1:1	101.2	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0
English Beans ..	1:1:1	109.5	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
Chinese Beans ..	1:1:1	97.2	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
English Maple Peas ..	1:1:1	97.2	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
English White Peas ..	1:1:1	97.5	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
Calcutta White Peas ..	1:1:1	93.8	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
American Maize ..	1:1:1	94.2	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
Argentine Maize ..	1:1:1	94.2	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
Maize ..	1:1:1	94.2	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1	11 1 1
Maize Germ Meal ..	1:1:1	90.2	8 1 3	8 1 3	8 1 3	8 1 3	8 1 3	8 1 3	8 1 3	8 1 3
English Feeding Barley ..	1:1:1	83.0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
English Oats ..	1:1:1	83.0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Malhi Cultus ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Brewers' Grains (dried) ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Brewers' Grains (wet) ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Burmese Rice Meal ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Wheat Middlings ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Wheat Sharps ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Wheat Middlings ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Wheat Bran (broad) ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Wheat Bran (narrow) ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Feeding Trench ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Linseed ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
La Plata ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0
Linseed Oil ..	1:1:1	84.5	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0	11 4 0

* and grade, £8 17s. 6d.; undecorticated, £7 17s. 6d.

as between buyer and seller, it is found that 1 lb. of protein usually costs about as much as $2\frac{1}{2}$ lb. of carbohydrates, this relative value being such as to allow for the manurial value if the nitrogen which the protein contains. Adopting this relative value for protein, the number of food units per ton on a food can be reckoned, as between buyer and seller, by multiplying the percentages of digestible proteins and fats each by $2\frac{1}{2}$ and adding the products to the percentages of digestible carbohydrates and fibre. The price per food unit is then found by dividing the price per ton by the number of food units reckoned as above. Great economy in buying can be effected by adopting the unit system of comparing prices. Every buyer of foods should recognise that what he wants is so many food units having a certain nutritive ratio, and not so many tons of food bearing a certain name.

The table on p. 5 gives the nutritive ratios of a number of feeding stuffs, and their prices at the four great markets of London, Liverpool, Hull and Bristol. From these, and the standard average composition of the feeding stuffs, the prices per food unit are calculated and given in the last four columns.

The following table gives in order the average prices per food unit at the four markets. From this it appears that considerable and irregular changes in price have occurred since last month. The most striking change is the decrease in price of English oats, which amounts to $6\frac{3}{4}$ d. per food unit. The present price of 2s. $6\frac{1}{2}$ d. per food unit makes oats still

Average Prices per Food Unit.

	s.	d.		s.	d.
Brewers' grains (wet) ..	0	10 $\frac{1}{4}$	Linseed cake, Indian ..	1	10
Ground nut cake ..	1	2 $\frac{1}{2}$	Beans, Chinese ..	1	10 $\frac{1}{2}$
Maize gluten feed ..	1	4 $\frac{1}{4}$	Maize, American ..	1	11 $\frac{1}{4}$
Soya bean cake..	1	5 $\frac{1}{2}$	Linseed, Calcutta ..	1	11 $\frac{1}{2}$
Maize, Argentine ..	1	6 $\frac{1}{2}$	„ cake, English ..	1	11 $\frac{1}{2}$
Brewers' grains (dried) ..	1	7 $\frac{1}{4}$	„ Bombay ..	1	11 $\frac{1}{2}$
Wheat bran ..	1	7 $\frac{1}{4}$	Wheat Sharps ..	1	11 $\frac{1}{2}$
„ pollards ..	1	7 $\frac{1}{2}$	Beans, English ..	2	0 $\frac{1}{2}$
Coconut cake ..	1	7 $\frac{1}{2}$	Linseed Oil ..	2	1
Maize germ meal ..	1	8 $\frac{1}{2}$	Cotton cake, Egyptian ..	2	3 $\frac{1}{2}$
Decorticated cotton cake	1	8 $\frac{1}{2}$	Peas, English dun ..	2	4 $\frac{1}{2}$
Palm-nut kernel cake ..	1	8 $\frac{1}{2}$	Cotton cake, Bombay ..	2	5
Malt culms ..	1	9	Peas, English maple ..	2	6
Maize meal ..	1	9 $\frac{1}{4}$	Oats, English ..	2	6 $\frac{1}{2}$
Rice meal, Egyptian ..	1	9 $\frac{1}{4}$	„ Argentine ..	2	7
„ „ Burmese ..	1	9 $\frac{1}{2}$	Feeding treacle ..	2	8 $\frac{1}{2}$
Linseed, La Plata ..	1	9 $\frac{1}{2}$	Peas, Calcutta whit ..	2	8 $\frac{1}{2}$
Wheat middlings..	1	9 $\frac{1}{2}$	Barley, English feeding	2	8 $\frac{1}{2}$
„ bran (broad) ..	1	9 $\frac{1}{2}$			

almost the dearest food on the market. Maize meal and Argentine maize have again declined slightly in price, and cotton cake has become still dearer. Other changes are not of any particular interest. Several foods appear in the list for the first time, namely, linseed, linseed oil, and treacle. Linseed at present prices works out at about the same price per food unit as linseed cake. For most purposes it has no advantages over the cake, especially as it must be crushed before use, and the crushing of raw linseed on the farm is not a very simple matter. Linseed oil is about 3*d.* per unit dearer than linseed cake, and its use seems to have no special advantages. Feeding treacle is very dear indeed, but it may still be advisable to buy a little, even at the present price, where it is desired to increase the palatability of straw.

Rations.—As regards suggestions for rations for October there is little to add to what was written in these notes last month. A few alterations may, however, be suggested for horse keepers.

Horses getting a full ration of clover hay, which is rich in digestible proteins, work well on about 10 lb. of maize per head per day, which is a cheap ration at the present price of maize. This ration will keep them fit and in good work during the short days.

Mares in foal should be well fed without being allowed to get fat. Maize and similar foods do not contain enough protein to provide for the nutrition of the unborn foal. A mixture of oats, bran and dried grains in equal proportions may be used at the rate of about a stone per head per day, according to the size of the mare.

Foals will pay for good feeding this year, if ever. During this month they may be given per head per day 1 lb. of oats and 2 lb. of bran, which may be increased, as the winter progresses and the foals grow, to 2 lb. of oats and 3 lb. of bran. It may be thought extravagant to recommend oats, even now their price has begun to decline, but at the present prices of horses in-foal mares and foals deserve special treatment.

ACORNS are a valuable addition to the rations of various classes of live stock, more particularly pigs, but also sheep, goats and adult cattle.

**The Feeding of
Acorns to
Live Stock.**

The food value of acorns lies chiefly in the large quantities of digestible carbohydrates which they contain. On this account they would form a useful supplementary food to green fodder, and to such foods as are rich in protein, and

they could, to a certain extent, replace in the ration cereal and other foods rich in carbohydrates.

Fresh acorns should preferably be fed only to the classes of live stock above mentioned, in moderate quantities, along with other foods, and the change to the ration containing acorns should be effected gradually. It is not safe to feed fresh acorns in any considerable quantity to pregnant sows, dairy cows or young cattle. Where pigs are driven into woods they must be given green or other complementary food which will supply a sufficiency of phosphates and lime, necessary substances which are present in acorns in only small quantities. Special care must be taken to withhold cattle from pastures where unripe acorns have been blown down.

Drying the acorns improves the flavour and feeding value and reduces the risk of illness, and acorn meal, prepared by grinding the kernels after drying and then separating them from the cracked husk by sifting after roughly crushing, has a feeding value approximately equal to that of barley meal and oat meal. Care should be taken not to feed any mouldy acorns.

Two instances of the value of acorns as food for live stock have recently come to the Board's notice.

In the first, the acorns were fed whole to horses in part substitution for oats, and also to sheep. Throughout last winter 16 horses on the farm received $\frac{1}{2}$ bush. of acorns and $1\frac{1}{2}$ bush. of oats each per week, instead of 2 bush. of oats; the acorns proved a good food, and were used until trifolium feeding began. The acorns cost 10d. a bush. for gathering; the oats they replaced would have cost 4s. 6d. per bush., so that the saving was about 1s. 10d. per horse per week. The acorns were also fed to sheep at the rate of $\frac{1}{2}$ pt. or a little more per sheep per day. In all, 700 bush. of acorns were fed to the horses and sheep.

In the second case, a farmer who last year had 200 bush. of acorns used them for feeding to 30 breeding ewes. The ewes received 1 bush. per day (say 1 qt. per head per day) until lambing approached, when the ration was reduced to $\frac{1}{2}$ bush. per day (or 1 pt. per head per day). It was remarked by this farmer that the ewes thrived well on the acorns, and left other food for them, and he was most glad to have had such a large quantity of useful food at a cost of only 6d. to 9d. per bush.

Note.—A Special Leaflet (No. 9) was issued last October dealing with *The Food Value of Acorns, Horse Chestnuts and Beech Mast*, and an article on the same subject, going into considerable detail, was published in this *Journal* for September, 1914.

THE following notes have been issued by the Board as Special Leaflet No. 44 :—

Preserving Green Maize. Grass having been fairly plentiful, it is probable that less green maize than usual has been required to supplement autumn pastures. With a view, therefore, to avoiding waste of a valuable crop, it is desirable that means should be taken to preserve, for future use, any surplus that may be available.

Maize should not be allowed to stand after about the middle of October, otherwise there is grave risk of its being destroyed by frost. Wherever, therefore, facilities for ensilage are lacking (see Leaflet No. 9, *Ensilage*) an attempt should be made to convert maize into hay.

For this purpose maize should be cut with a scythe as close to the ground as possible. A short stubble will facilitate subsequent tillage operations. The maize should be allowed to dry in the swathe until the leaves are quite limp. This will take, usually, from 24 to 48 hours, depending upon the weather. If left too long it spoils rapidly. It is then made into sheaves of about 12 in. diameter. "Stooking" or "shocking" in the ordinary way is impracticable on account of the ease with which maize sheaves are blown down. The best plan is to set up a row of hurdles and arrange the sheaves as closely as possible on both sides, keeping them in position by means of a line of binder twine. After standing for about a fortnight or three weeks, the partially dried maize may be used instead of straw for the following purposes :—

- (1) To cover potato clamps where the potatoes will be marketed before Christmas ;
- (2) To cover mangold clamps ; and
- (3) As a bottom littering in open pig and cattle yards.

In experiments conducted at Cambridge stacking has not been successful, whether in the open or under cover. Decay tends to develop about the bands, and stock refuse the fodder. Even as late as February and March the stalks contain much juice which has an acid taste.

In America maize is often left for several months, and sometimes throughout the winter, to cure in shocks in the field. Although, with such treatment, the maize inside the shock may remain bright and green, and free from mould, it is computed that the loss in nutritive value amounts, on the average, to at least 20 per cent. Even when the curing is completed under cover, there is a loss of not less than 10 per

cent. This loss falls chiefly on the sugars, which undergo fermentation in the stalks.

Further experiments in the drying of maize are necessary ; for the present it is suggested that the sheaves, after preliminary drying in the field, should be built, one sheaf deep, round a hollow wooden framework, and protected from the weather, or they might be ranged along the sheltered sides of hay or corn stacks. Where labour is available, the leaves might be stripped from the standing crop, dried, chaffed and used in a mixture.

IN view of the present high cost of feeding stuffs it is necessary that as much as possible of their manurial value should be recovered in the dung. The fact that the ordinary supplies of potash are meanwhile cut off furnishes another reason for preserving manure, especially liquid manure, with great care ; liquid manure is rich in potash. In districts, therefore, where straw is scarce, or where it can be profitably fed to stock, farmers and horse-keepers should use for litter any other suitable material that may be available at a reasonable cost. Bracken or "fern" is specially worthy of attention at the present time.

**Bracken as
Litter.**

Bracken possesses considerable value as litter, and in many places it may be obtained for the cost of cutting and carting. Bracken harvested while still green usually contains as much phosphoric acid as straw, and much more nitrogen, but less potash. If exposed to rain throughout the winter a considerable loss of substance is likely to result, although bracken cut in April has been found, on analysis, to have a similar composition to straw.

Bracken possesses a considerable power of absorbing ammonia and urine. To secure the full absorptive effect, however, bracken must be very thoroughly trampled upon by stock.

Dung made from bracken may be expected to be equal in chemical composition to dung made from straw. On the other hand, it takes longer to decompose in the soil, the fibrous woody stems being only slowly attacked. It therefore opens up the soil more, and is for that reason likely to be more useful on a heavy clay than on a light sandy soil. Bracken should be cut and dried in autumn, but where this is impracticable it may be cut and carted during suitable weather throughout the winter months.

THE attention of the Board has been directed to the effect which the war has had upon the supplies of goose, turkey and duck quills available in Great Britain for commercial purposes. The chief sources of supply in recent years were Austria and Germany, but since the outbreak of war these imports have ceased. The present supplies are inadequate for the needs of the manufacturer, and there is a steady demand for quills of good quality, which could be met to a large extent by the proper selection and marketing of home supplies. Large quantities of English and Irish quills were formerly used in manufacture and the Board desire to direct the attention of breeders and dealers in poultry to the possibility of obtaining a ready market for one of the by-products of their industry, and of assisting the manufacturer.

The following scale of prices affords a guide to the present value of suitably selected quills :—

Large Goose Quills, per cwt.	..	50s. to 60s., according to quality.		
Small " " "	..	30s. " 40s.	"	"
Large Turkey " "	..	50s. " 60s.	"	"
" Duck " "	..	25s. " 30s.	"	"

In selecting and preparing the quills for despatch they should be tied in bundles weighing about 8 oz. with the barrels all pointing in one direction. If possible they should, for the sake of convenience and economy in carriage, be collected by a responsible person so that they may be despatched in lots of not less than half a hundredweight.

The Board are prepared to give information as to firms who would be willing to purchase such consignments in cases where producers find difficulty in obtaining a market.

A DEPARTMENTAL Committee was appointed on 11th April, 1910, by the President of the Board of Agriculture and Fisheries

Eradication of Swine Fever. to enquire into the cause of the continued prevalence of swine fever in Great Britain, and to report whether it is practicable to adopt any further measures with a view to secure its speedy extirpation.

The first Interim Report [Cd. 5671, 2d.] of the Committee was presented on 8th May, 1911, and a summary will be found in this *Journal* for June, 1911, p. 235. The Committee's Second Interim Report [Cd. 7247, 4½d.] was presented on 26th January, 1914, and was summarised in this *Journal* for March, 1914, p. 1098.

The Final Report of the Committee [Cd. 8045, 8d.], dated 12th August, 1915, commences by considering an account of experiments carried out by Sir Stewart Stockman at the request of the Committee.

Methods of Spread of the Disease.—After consideration of the report on the experiments the Committee arrived at the following conclusions with regard to the spread of the disease:—

- (1) That the manure of pigs suffering from swine fever is infective.
- (2) That a period of fourteen days may be regarded as sufficient to bring about the disinfection of infective manure through natural causes.
- (3) That rats are not, as has been suggested, pathological carriers of swine fever.
- (4) That all the available evidence suggests that swine fever is not disseminated by external parasites.
- (5) That while persons, vehicles, and animals which have been in contact with infected pigs or premises may carry infective material mechanically within the area of their movements, subject to the time-limit indicated above, the evidence leads the Committee to the conclusion that all wide dissemination of disease is due to the movement of infective pigs.
- (6) That a pig may become infective in three days after it has itself contracted infection and before it has actually exhibited clinical symptoms of the disease, and a pig which has contracted the disease may continue to be infective for a variable period, the extent of which has not yet been fully ascertained, but which is often of considerable duration.
- (7) That there would appear to be cases in which healthy pigs which have not been visibly affected by swine fever and which, on post mortem examination show no evidence of having suffered from swine fever, are infective and continue to be so for a considerable time.

The Committee state that while the experimental investigation of this matter is very difficult and the evidence in support of the existence of carriers is largely circumstantial, the possibility that the carrier pig exists cannot be lost sight of, especially in considering the practicability of extirpating swine fever.

Serum Treatment.—From Sir Stewart Stockman's experiments with regard to the use of serum treatment and vaccination as methods of combating swine fever, it appears to the Committee that treatment with serum is highly effective in saving the lives of pigs which are exposed to infection immediately after serum has been injected, if they are free from infection at the time of treatment. Serum has, however, no curative effect, and the results of its use as a protection are so far disappointing in the case of young sucking pigs.

Treatment with serum alone confers only a short period of immunity, but this can be converted into a prolonged immunity if the pigs treated with serum are allowed to come in contact with infection. This procedure constitutes what may be called a natural vaccination.

"Artificial vaccination" consists in the simultaneous application of serum injection with an infection produced by the administration of virus by feeding or by inoculation. Artificial vaccination appears to the Committee to be attended by greater risks of producing severe forms of swine fever than natural vaccination, and the actual inoculation of virus appears to be more dangerous than feeding with virus.

Special Swine Fever Procedure Areas.—The special procedure adopted in certain areas was considered by the Committee in its effects during 3½ years. This special procedure has been as follows: Upon the declaration of disease, all the swine upon the premises which have been subjected to the risk of infection are slaughtered; contact swine on other premises are traced and slaughtered; post mortem examinations are made, and, if the disease is found to exist, tracing and slaughter on the same lines is carried out in respect of these premises also; in order to minimise the risk of the introduction of disease into these areas from other districts, the movement of swine—except from areas subject to similar procedure, or from Ireland—other than those marked for immediate slaughter, is limited to swine for exhibition or breeding purposes.

It appears to the Committee, in the special procedure areas in which swine fever had previously been brought to a low ebb, that this special procedure has been successful in keeping down the number of outbreaks of disease at a time when the number of outbreaks underwent a very large increase in other parts of Great Britain. The Committee state, however, that the results are not such as to indicate that swine fever can be eradicated by the procedure in these areas unless all pigs from other areas are excluded from them. The special procedure has been abandoned for the present.

General Conclusions.—The general conclusions of the Committee are that the continued prevalence of swine fever appears to be due principally to its highly contagious character, and the difficulty of its recognition by the pig owner in its early stages and in its milder forms.

To these causes must be added the difficulty of completely tracing the place of origin and the movement of pigs by which the disease has spread.

The extirpation of the disease is practicable only by such drastic measures of slaughter as would involve a prohibitive outlay, and by such severe restrictions on movement as would be fatal to the industry of pig keeping.

Present circumstances, therefore, do not encourage the view that the extirpation of swine fever can be speedily accomplished or that such an objective should continue to be made the governing idea of administrative policy.

This conclusion, however, does not exclude the possibility that new preventive methods may bring about a condition of affairs more favourable to the prospect of eradicating the disease, and the study of such methods is being actively pursued.

Recommendations.—In view of all the evidence laid before them the Committee recommend :—

(1) That the attempt to extirpate the disease by general slaughter should be abandoned for the present ;

(2) That the immediate object of future policy should be—

(a) To reduce mortality from the disease.

(b) To control the spread of the disease.

(3) That in order to reduce mortality, the use of protective serum without avoidable delay in infected herds should be encouraged by every possible means and in particular by facilitating the supply of serum.

(4) That the production of immune herds by simultaneous administration of serum and virus should be undertaken where pig owners so desire, on premises selected as suitable and under careful supervision and restrictions.

(5) That in order to control the spread of disease the isolation of infected premises should be maintained by restrictive regulations, but that such restrictions should allow of the introduction to infected premises of pigs to be treated immediately with serum.

(6) That careful consideration should be given in the light of further experience to the extent to which existing general restrictions on movement may be relaxed as the result of new measures.

(7) That in view of the experimental results above referred to the lapse of a short period of time may be relied upon for disinfection of premises, and should be regarded as preferable to chemical disinfection in the case of large quantities of manure and of premises not readily capable of being disinfected by artificial means.

While the Committee submit the above recommendations, based on the present state of knowledge, they are strongly impressed by the possibility of artificial vaccination as a method of combating swine fever.

They also recognise the advantages that might accrue from the discovery of a reliable diagnostic test for obscure cases and they therefore recommend that investigation into this and cognate matters should be actively continued.

EARLY in the present year Mr. Edward Brown, F.L.S., was asked by the President of the Board of Agriculture and Fisheries to undertake an enquiry, on the spot, into the condition of the poultry industry in Wales. The enquiry was chiefly directed towards ascertaining (1) the quality and suitability of the stock, (2) the method of housing and management, (3) the prevalence of disease, and (4) the methods of marketing. The results of Mr. Brown's exhaustive investigations, together with his recommendations for the development and improvement of the industry, are given in a Report of some 56 pages, which is published as a Supplement (No. 14)* to the present issue of the *Journal*.

NOTES ON AGRICULTURAL CO-OPERATION.

THIS Club was founded in 1888 at Haddenham, a rural village in Cambridgeshire. The preface to its rules is as follows :—

"Whereas it has from long experience been proved that the loss of stock, by accident or otherwise, has often been attended with great inconvenience to many persons we, being Stock owners of this Parish, have in consequence thereof formed ourselves into a Club for the purpose of raising a fund by a small monthly subscription in order to lessen such loss in future ; and have resolved upon the following Rules."

The Society insures both horses and cattle. Its operations embrace six parishes, and all stock-owners living within a radius of five miles are eligible for membership. Each of the eight villages situated within this area has separate representation on the Committee, which consists of 23 members. There are now altogether 122 members, mostly small holders, some of whom have risen from the position of labourers, a number of them being actual owners of the land they cultivate. Some of them have quite small holdings and own each only one cow or one horse.

A new member is not entitled to receive any benefit from the Society until he has been enrolled three months. The entrance fee for a horse is 2s., for a cow 1s. 6d. The animals insured are not valued except when they fall ill or die, when the valuers, consisting generally of the members of Committee for the village concerned, inspect the animal and fix its value, which is paid in full to the owner, if the animal dies, but subject to a maximum of £10 for a cow and £15 for a horse. The Club meets monthly and each member is bound to pay a subscription at the rate of 4d. per month for a cow, and 6d. per month for a horse. The

* Price 4d. post free. It will be forwarded free to subscribers on written application.

rules say that "The Committee shall have power to make levy of 1s. per head of stock for every loss sustained by the Club, such levy to be increased (if found necessary at the next monthly meeting)." On several occasions in the Club's history an extra levy has been made. A foal can be entered on the Club night falling on or after the 24th June in each year and any calf can be entered when 4 months old. The Club does not pay compensation for an animal whose death has been caused by fire or lightning.

During the ten years ending 1913 there was an increase in the number of members from 121 to 122, in the number of horses insured from 194 to 240, and in the number of cattle insured from 153 to 187. On the average a member insures about 2 horses and 1.5 cows, the largest number of animals insured by any one member being 10 horses and 4 cattle. For the ten years the average number of horses insured has been 223, and the average number of cattle insured 171. The number of claims paid has averaged 10 horses and 4.3 cattle, so that the average death-rate per cent. per annum has been 4.5 for horses and 2.5 for cattle. The average amount paid on claims per annum has been £83 17s. for horses and £36 11s. for cattle. Thus the average amount paid per animal that died has been £8 8s. for a horse and £8 10s. for a cow, and the average loss on claims per animal insured has been per annum 7s. 6d. per horse and 4s. 3d. per cow. As the amount received in monthly contributions has been per annum only 6s. per horse and 4s. per cow, the income from this source has not been sufficient to cover the expenditure in payment on claims.

The only other expenditure the Society has had to meet has been the costs of management, which have been small, as the officers of the Society all render their services gratuitously; the Secretary, who is a retired farmer, being allowed to spend up to 8d. per member on clerical expenses. For the last 10 years the costs of management have averaged only £5 15s. per annum, equivalent to an average of 3½d. per animal insured—a very low rate. Including payment on claims the total expenditure has averaged £126 3s. per annum.

Besides the monthly subscriptions the Society has received some income from entrance fees, averaging £8 10s. per annum, and from the sale of carcasses, which are sold to a knacker at a contract price of 25s. each carcass of whatever kind. Including receipts from all sources, the total income has averaged £122 2s., and, as the total expenditure averaged £126 3s. there has been an average loss per annum of £4 1s. During the 10 years' period the net assets of the Society fell from about £102 to £61 9s. 6d. at the end of 1913, notwithstanding a special levy of £18 18s. made in 1910.

The best-managed Societies arrange so that, on the average, their income shall exceed their expenditure, the surplus going to build up a reserve fund, which not only secures the members against having to make special levies in bad years, but brings in a steady and growing income in interest, and after it has reached a satisfactory figure, enables the Society, without danger, to increase the benefits it offers to its members or to reduce the contributions required from them. This Haddenham Society has been on the whole well and economically managed, but has not been able to build up a reserve fund, simply because the insurance contributions it charges are not quite high enough to cover the actual losses.

In regard to cows, the actual average death-rate for the last 10 years has been 2·5 per cent. per annum, which is just about equal to the average of the experience of all the cow-insurance societies in England and Wales (2·6 per cent.). Under the plan adopted by this Society under which no more than £10 is paid on the death of any cow however valuable, the actual average amount paid has been £8 10s. per cow that died, equal to 4s. 3d. per cow insured. The monthly subscriptions paid for a cow amount to 4s. per annum, which is not quite enough to pay for the losses, though the deficiency is not serious.

In regard to horses, the actual average death-rate of the last 10 years has been 4·5 per cent.—not a high rate as compared with the experience of other societies which insure horses. The Society pays up to £15 on the death of an insured horse, and the actual average payment made on horses has been £8 8s., equivalent to a rate of 7s. 6d. per horse insured per annum. As the monthly subscriptions paid for horses only amount to 6s. per annum, it is evident that the Society has lost money on the insurance of horses, and that the chief step required to place its finances on a satisfactory footing is to raise the rate of insurance contribution payable on horses to at least 8s. a year, or 8d. a month, instead of 6d. If this were done, the Society might hope to avoid the necessity of making special levies, but it could not expect to see its reserve increase at all rapidly; and if it aims at this object, it would be wise, to judge from its 10 years' experience, to raise the insurance contributions on cows from 4d. to 5d. a month, and on horses from 6d. to 9d. a month. The rate for horses should be nearly double that for cows, because the Society may have to pay £15 for a horse, but not more than £10 for a cow, and still more because its experience shows that the average death-rate among the insured horses is 4·5 per cent. per annum against 2·5 per cent. for the insured cows.

The Society might do still better if it adopted the system under which the Coveney New Cattle Club has been able to build up a reserve fund of £365. That is to say, it might agree to pay seven-eighths of the value of any animal insured, up to a maximum of £35, and require the owner to pay 1½d. per £1 per quarter on the value of the animal, unless it were a brood-mare, in which case he should pay 2½d. per £ per quarter.

OFFICIAL NOTICES AND CIRCULARS.

THE Board of Agriculture and Fisheries have been informed by the Army Council that in view of the possible shortage of agricultural labour for the Autumn cultivations, furlough

Autumn Cultivation.	will be given at the discretion of the Military Authorities, and as circumstances may permit, to a limited number of soldiers of the New Armies and of the Territorial Force who have been accustomed to work farm horses.
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The furlough granted to each soldier will last only for such number of days, not exceeding four weeks, as he is actually required for the work.

The employment of soldiers will be subject to the following conditions:—

1. That suitable labour cannot be obtained in the locality.

2. That the farmer will undertake to pay each soldier sent at his request :—

(a) 4s. a day if the soldier provides his own board and lodging.

(b) 2s. 6d. a day if board and lodging is provided by the farmer.

The hours worked to be those customary in the district.

3. That the farmer will provide conveyance from and to the nearest railway station.

The above rates to be inclusive of all allowances and to be paid wet or fine.

No charge will be made to the farmer for railway travelling expenses.

Every endeavour will be made to ensure that the men released have been accustomed to work farm horses, but no guarantee to this effect can be given, and if a farmer wants his son or one of his former labourers efforts will be made to arrange accordingly.

Applications from farmers who desire to employ soldiers must be made as soon as possible to the Board of Trade Labour Exchanges, when the application will be transmitted to the Military Authorities. Forms for the purpose will be obtainable on and after the 15th instant from the Local Labour Exchange, the address of which can be obtained from the nearest Post Office.

OWING to the necessary demand of the Military Authorities on the Railway Companies serving some of the fruit-growing districts, it may be found that they are unable to accept for

**Storage of Apples
and Pears.**

transport the whole of the crop of apples and pears as picked. It may, therefore, be necessary for growers to store some part of their crop. In these circumstances the Board desire to direct the attention of growers to the following notes which have already been published in the Board's Special Leaflet No. 6.

The requirements for the proper storage of apples and pears are not the same. Apples require to be kept in a cool, rather moist place, where there is enough ventilation to prevent saturation. Pears require warm, dry surroundings, but even under the most favourable conditions they will not keep long.

A few days after apples are put in store they begin to sweat, and continue to do so for about three weeks. During this time there must be a free current of air round them which must not be too dry or they will begin to shrivel. After the sweating period is over this is not so important. For larger growers a shed or storehouse is required if no cool cellar is available, and in preparing a store the following points should be remembered :—

1. The fruit must be protected from frost, but subject to this precaution the temperature should be as low and equable as possible. A cave in a sand or chalk bank makes an excellent storehouse.
2. A moist atmosphere is necessary. The best kind of floor is the bare earth which can be damped occasionally.
3. Ventilation to prevent stagnant and heated air is necessary, especially during the sweating period.
4. Apples easily absorb flavours from their surroundings. They should not be put on new wooden shelves or on straw or on

hay, nor should any strong smelling vegetable or other material be kept in the same room. Shelves of slate, or old seasoned wood, may be used.

A useful apple store may be made by digging a large hole about 10 ft. wide and as long as is required. The depth should be about 2 ft. A wall one brick thick and about 4 ft. high should then be built on either side, and the earth that has been dug out heaped up outside the wall. A roof made of rough rafters and thickly covered with thatch should be built over the top, and shelves fitted inside on which the apples may be heaped. There should be a door at each end so arranged as to admit air and exclude light.

Apples should never be stored in an attic or top room of a house.

In cases where apples or pears are ripe or are intended for immediate consumption the grower should give the earliest possible notice of his intention to forward by rail, specifying the quantity to the goods agent at the station from which they propose to consign.

THE Board desire to point out to live stock owners that the importation of cattle into Ireland can be effected only on the authority of, and subject to, the conditions of a Permit granted by the Department of Agriculture and Technical Instruction for Ireland, but that

Department are prepared to consider applications for Permits in respect of animals proposed to be imported for breeding purposes or exhibition. Each application must be supported by such information regarding the proposed importation as the Department may require and by satisfactory evidence as to the health of the cattle concerned and of all other animals on the premises where the cattle are, or have recently been, located. Forms for the purpose of furnishing the necessary information and evidence may be obtained on application to the Secretary, Department of Agriculture and Technical Instruction for Ireland (Veterinary Branch), 50 & 51, Upper Mount Street, Dublin.

Intending importers should note that in the case of young calves, the importer will be required to make suitable arrangements for the care and feeding of the animals during the importation journey.

Applications for Permits to import cattle (or calves) recently exposed in any open fair or market will not be considered.

THE purpose of the Board's Special Leaflets was explained in the note in this *Journal* for September, 1914,

Issue of Special Leaflets. p. 566, and lists of those issued have been given from time to time. Since the last list given (August, 1915, p. 468) the following have

been issued :—

Special Leaflet, No.	35.	Transport of Agricultural Produce.
"	" 36.	Winter Oats.
"	" 37.	Economy in Food.
"	" 38.	Bracken as Litter.
"	" 39.	Potato Disease.
"	" 40.	Notes on Breaking up Grass Land.
"	" 41.	The Importance of Producing Cheese.
"	" 44.	Preserving Green Maize.

THE Committee who are responsible for the National Egg Collection for the Wounded, make an earnest appeal to all who are interested in the welfare of the soldiers in our hospitals **National Egg Collection for the Wounded.** for assistance at the present time when they find it most difficult to supply the 300,000 eggs which are required weekly. Help may be

given by organising a regular collection of new-laid eggs in districts where no provision for collection is made at present, or by collecting money for the purchase of eggs from people who are unable to make gifts in kind.

Eggs collected for this purpose should be despatched, carriage forward, to the Committee's Central Depot, National Egg Collection, Messrs. Harrods, Ltd., Trevor Square, London, S.W. Receipt books for eggs and collecting cards for cash may be obtained on application to Mr. F. Carl, 154, Fleet Street, London.

WHERE the residues of calcium carbide (used in the production of acetylene) can be obtained free of cost or at a nominal price, the material should be worth using for liming purposes.

Calcium Carbide

Residue for Liming.

The residues are chiefly slaked lime containing from 30 to 40 per cent. of water; the dry matter contains about 60 per cent. of quicklime, *i.e.*, about 50 per cent. of CaO. There is a small amount of magnesia present in the residues, together, usually, with small quantities of silicon, sulphur, iron, phosphorus and carbon, but not enough to render the residues generally unsuitable for agricultural purposes.

Drying the residues would facilitate carriage, but would at the same time add to the cost.

IN certain districts where straw is scarce or where it may be profitably fed to stock, farmers and stock-owners should consider the possibility of using bracken for litter. A special leaflet, giving a short account of the use of bracken, has been issued by the Board of Agriculture and Fisheries, who will send a copy to any

**Use of Bracken
as Litter.**

applicant on receipt of an unstamped postcard addressed to them at Whitehall Place, London, S.W.

THE following notice was issued to the Press on 16th September :— Favoured by moist weather in August, potato disease (*Phytophthora infestans*), has destroyed the haulm of potato crops in many parts of the country.

Potato Disease.

The dead haulm, if allowed to lie on the soil, may infect the tubers. In view, however, of the drier weather of the past few weeks it is probable that as yet relatively few tubers have been attacked, and, consequently, that the immediate removal of diseased haulm would minimise risk of infection. As a further precaution, however, all crops should be lifted as soon as possible and carefully stored.

Further particulars of this disease, with suggestions as to storage of the crop, will be found in Special Leaflet No. 39 (Potato Disease), to be had, gratis and post free, on application to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, S.W.

THE National Insurance Commissioners have recently issued further regulations (Statutory Rules and Orders, 1915, No. 426, price 1d.) as to the classes of employment to be considered as employment within the meaning of Part I. of the principal Act. These regulations, so far as they concern employment connected with agriculture, provide as follows :—

**Regulations under
National Insurance
Act, 1911.**

Flower-pullers, fruit-pickers, hop-pickers, onion-peelers, pea-pickers, and potato-pickers on an agricultural holding are to be considered as employed within the meaning of Part I. of the principal Act only if at the time of entering upon the employment they were already insured persons, or were holders of certificates of exemption granted in pursuance of Sub-section (3) of Section 81 of the principal Act (referring to Irish migratory labour).

Hop-tyers on an agricultural holding are not to be considered as so employed.

Milkers are not to be considered as so employed unless they are otherwise ordinarily employed by the body or person to whom the service is rendered.

THE Annual Report of the Chief Veterinary Officer of the Board for the year 1914 has been issued [Cd. 8,043, price 3d.]. The chief features of the Report are an account of the outbreaks of foot-and-mouth disease during the period, an estimate of the prevalence of swine tuberculosis and swine erysipelas, an article embodying the results of an investigation conducted at the laboratory in connection with Tropical and English red water and a report on the use of anti-abortion vaccine for epizootic abortion.

**Report of the Chief
Veterinary Officer
for 1914.**

THE Board have issued the following circular to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894 to 1914 :—

**Parasitic Mange
amongst Cast Army
Horses.**

Sir,—I am directed by the President of the Board of Agriculture and Fisheries to acquaint you, for the information of your Local Authority, that his attention has been drawn to certain cases of parasitic mange found amongst horses which had a short time previously been cast from the Army, and to the risk of the spread of the disease to other horses with which they were brought into contact.

Lord Selborne has been in communication on this subject with the Army Council, who have suggested that with a view of co-ordinating the efforts being made to control and eradicate the disease, Local Authorities might be asked to arrange that information as to cases of the disease found amongst cast Army horses should be at once reported direct to the General Officer Commanding the Command concerned in order that prompt investigation may be made, and steps taken to prevent further sale of any affected animals which may be discovered as the result of such investigation.

Lord Selborne desires me to request that your Local Authority will be so good as to make the arrangements suggested by the Army Council, and that such arrangements should apply not only to cases of parasitic mange, but also to the other equine diseases scheduled under the Diseases of Animals Acts, namely, glanders (including farcy), and epizootic lymphangitis.

The various commands and the area covered by each are shown in the monthly Army List.

I am, &c.,

SYDNEY OLIVIER.

THE preliminary statements of areas under crops and number of live stock on agricultural holdings as returned in June, 1915, issued by the Agricultural Departments for England and Wales, Scotland and Ireland, respectively, enable the following summary for the United Kingdom, with the comparative figures for 1914, to be compiled. The returns for the Channel Islands and the Isle of Man are not included.

	1915.	1914.	Increase (+) or Decrease (—).	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Per Cent.</i>
Wheat	2,334,090	1,904,930	+ 429,160	+22.5
Barley	1,523,980	1,871,170	— 347,190	—18.6
Oats	4,148,050	3,877,960	+ 270,090	+ 7.0
Potatoes	1,202,520	1,197,010	+ 5,510	+ 0.5
Turnips and Swedes ..	1,617,460	1,752,570	— 135,110	— 7.7
Mangolds	500,490	515,860	— 15,370	— 3.0
Clover, Sainfoin, &c., for hay	2,839,920	2,902,900	— 62,980	— 2.2
Permanent Grass for hay	6,420,360	6,489,880	— 69,520	— 1.1
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	
Horses used for Agricultural Purposes (including mares kept for breeding) ..	1,214,290	1,320,470	— 106,180	— 8.0
Unbroken One year old Horses	318,870	350,360	— 31,490	— 9.0
(including Stallions). Under one year ..	166,480	171,730	— 5,250	— 3.1
Total	1,699,640	1,842,560	— 142,920	— 7.8
Cows and Heifers in milk or in calf	4,476,470	4,576,850	— 100,380	— 2.2
Two years old and above ..	2,217,760	2,326,580	— 108,820	— 4.7
Other One year old Cattle	2,655,570	2,587,850	+ 67,720	+ 2.6
Under one year ..	2,781,570	2,653,280	+ 128,290	+ 4.8
Total Cattle	12,131,370	12,144,560	— 13,190	— 0.1
Ewes kept for breeding ..	11,304,730	11,221,600	+ 83,130	+ 0.7
One year old	5,390,930	5,037,910	+ 353,020	+ 7.0
Other and above ..	11,485,880	11,626,580	— 140,700	— 1.2
Sheep Under one year ..	28,181,540	27,886,090	+ 295,450	+ 1.1
Total Sheep	28,181,540	27,886,090	+ 295,450	+ 1.1
Sows kept for breeding ..	437,810	492,980	— 55,170	—11.2
Other Pigs	3,345,970	3,440,910	— 94,940	— 2.9
Total Pigs	3,783,780	3,939,890	— 156,110	— 4.0

IN view of the need for husbanding the food supply of the country, the Board of Agriculture and Fisheries decided last August that the

**Food Supply and
the Slaughter of
Pigs.**

slaughter of pigs for the purpose merely of reducing the risk of the spread of swine fever should be resorted to as little as possible, and that the slaughter of breeding sows or partially matured animals purely as a matter of precaution should be avoided. The Board have therefore relied on isolation combined with the slaughter of all swine distinctly sick of swine fever at the time of diagnosis.

Meanwhile, investigations into the efficacy of the injection of anti-swine-fever serum which were being carried out before the war began have been continued, and the results obtained, together with the evidence accumulated as to its use in other countries, show that if proper precautions are taken immunity from Swine Fever can be established by serum treatment.

The Board are now in a position to offer serum treatment of pigs free of cost,* in the early stages of an outbreak of swine fever, and they wish to impress on all owners that to obtain the best results from this treatment notification of the suspected existence of swine fever on their premises should be made at the earliest possible date. Any delay in notifying not only renders the owner liable to prosecution for failing to comply with the provisions of Article 1 (1) of the Swine Fever Order of 1908, but also tends to increase his loss owing to more pigs becoming affected before serum treatment is carried out.

THE President of the Board of Agriculture and Fisheries desires to call the attention of agriculturists to the facilities afforded by Local Authorities, under the Fertilisers and Feeding

**Sampling and Analysis
of Feeding Stuffs.**

Stuffs Act, 1906, for the sampling and analysis of feeding stuffs purchased for the use of stock. The effect of the European war on the prices and supplies of feeding stuffs and the shortage of skilled labour may result in mistakes and mis-descriptions of these materials on the part of sellers. It is, therefore, very desirable that buyers should avail themselves of the safeguards provided by the Act; whereby a purchaser may have a sample taken and submitted for analysis to the Agricultural Analyst by the Official Sampler appointed by the Local Authority. A small fee is charged by the Local Authority for these services. In order that proceedings may be instituted against the seller in the event of the analysis disclosing an offence under the Act, the sample should be taken within 10 days of the receipt of the goods or the invoice—which ever is the later—and after three clear days' notice to the seller of the intention to take the sample.

THE following scheme for the appointment of War Agricultural Committees has been published by the Board:—

**Scheme for the
Appointment of War
Agricultural
Committees.**

County Committees—Each county council shall appoint a War Agricultural Committee for the county. The committee may consist either of an existing committee or sub-committee of the council with co-opted members or it may be constituted for this special purpose. In any event it will have no statutory basis. Whatever be the method of formation

* See this *Journal* for September, 1915, p. 594.

adopted the committee should be fully representative of all the agricultural interests of the county, whether landowners, farmers, labourers, and others. In those counties where committees have already been established to deal with the organisation of farm labour it will obviously be desirable to co-ordinate their work with that of the War Agricultural Committee, and it is very important that the committee should include representatives of the Chamber of Agriculture, the Farmers' Union, and other agricultural societies or institutions in the county.

One of the existing officials of the county council, should, if possible, be nominated to act as clerk to the committee, and it is hoped that so far as their other duties permit the other members of the administrative staff of the council will be allowed to give the committee such help as they can.

The Board of Agriculture and Fisheries will nominate one of their commissioners or inspectors to act as their local representative for the purpose of the scheme, and it is hoped that he will be invited to attend the meetings of the committee.

District Sub-Committees.—The county council or the War Agricultural Committee when formed shall appoint a local committee for the area of each rural district in the county, and of each urban district which contains any considerable amount of agricultural land, to be composed of persons representing the various agricultural and horticultural interests of the district.

In most cases the utility of the local committee will depend upon the choice of its chairman and its clerk.

Functions of the Committee.—The principal functions of the committees will be as follows:—

1. To organise the supply of agricultural labour within the county.

The Board will arrange for the supply to each county committee of the information available under the National Registration Act as to the number of agricultural labourers in each rural or urban district in the county. The county committee should then ask the sub-committees to consider and report whether the supply of agricultural labour in the district is adequate, and if not, as to the extent of the deficiency. These reports should be considered by the county committees in consultation with the labour exchange officials with a view to meeting any deficiency as it arises by promoting co-operation in the use of labour, by the transfer of labour from another district, and by the employment of women or otherwise. County committees may well devote particular attention to the possibility of training women, and encouraging them to engage in agricultural work on the lines that have been successfully adopted by certain county and provincial councils.

2. To consider how the production of food in the county can be maintained, and, if possible, increased, always acting in close co-operation with the landowners, farmers, labourers and the members of the rural community.

The Board will supply to each county committee figures showing the acreage under the various crops and grass in each petty sessional division at the present time and in earlier years, which will be a guide to the extent to which an increase in the area under arable cultivation may be practicable.

The county committee should endeavour, through the agency of the local committees, to promote an increased production of those crops or stock which can be produced to the best advantage in the various districts, and will be to the greatest advantage to the State

during the war. The principal need at present is an increased production of wheat, oats, potatoes, meat, milk, cheese and bacon. The Provincial Advisory Council for Agricultural Education should be consulted as to the best means of enabling the services of the staff of the agricultural college or research institution of the province to be made use of in aid of the purposes of the schemes, and the committees should endeavour to persuade farmers to avail themselves of such services. Members of public bodies, such as the Chamber of Agriculture, the Farmers' Union, local agricultural societies, and the agricultural organisers and instructors of the counties should also be employed to advise as to the best and most profitable use of land.

Efforts should be made to stimulate increased food production by villagers as well as by farmers. Cottagers and allotment holders should be encouraged to live on the produce from their gardens and allotments as much as possible, and to increase their production of potatoes, vegetables, pigs and poultry.

3. To obtain information as to the requirements and supply available of (a) agricultural implements and machinery, and (b) fertilisers and feeding stuffs, and to report to the Board any deficiencies in these respects, or in the facilities for obtaining delivery, and also to encourage and promote co-operation amongst farmers for the procuring of supplies and machinery and for mutual assistance in the case of the latter.

4. Generally to assist and advise landowners, farmers and labourers in the county, and to inform the Board of any special difficulties which may come to their notice.

MISCELLANEOUS NOTES.

DURING recent years the frequency with which tuberculosis has been found among swine, which were suspected by their owners of being affected with swine fever (and consequently reported to the Board under the swine fever order of 1908) has created the impression in the minds of the Board's veterinary officers that tuberculosis in swine is increasing. A record of such cases has been kept by the Veterinary Department during the past year—1914—and will be kept for a series of years.

* Tuberculosis was diagnosed on 633 different premises on which were kept 8,632 swine of all ages. Of these, 989 were found to be affected with this disease—11·4 per cent. It must be borne in mind that this 11·4 per cent. probably does not represent the total number of swine affected, as it is only the proportion found to be affected at the time of the report to the Board. The average number of swine kept on these premises was 13·6, of which on an average 1·3 pigs were returned as affected.

As tuberculosis in swine is not a notifiable disease, owners are under no obligation to inform the Board of the presence of the disease in their herds. No reliable figures are, therefore, available showing the full extent of the disease in Great Britain. A further estimate of the extent of the disease may be formed, however, by consulting the Reports of the veterinary officers attached to large city abattoirs, as Glasgow or Birmingham.

* Report of the Chief Veterinary Officer for 1914 [Cd. 8043, price 3d.].

In Glasgow, 35,793 pigs were slaughtered during 1914, and of these, 1,986 were found to be tubercular; while, in Birmingham, 91,397 swine were slaughtered, and of these, 2,408 were tubercular: that is, 3.5 per cent. of all pigs slaughtered in the two cities were found to be affected.

If, then, 3.5 per cent. of all swine slaughtered in such cities as Glasgow and Birmingham, where meat inspection is highly organised, are tuberculous, it is fair to assume that even a higher percentage would be found affected in cities where the inspection is not so thorough, for it is well known that owners of doubtful carcasses avoid sending them to markets where the inspection is strict.

Great Britain usually carries a stock of about 2½ million swine, the great majority of which are eventually slaughtered for food. If we accept that even 3 per cent. of these are affected with tuberculosis, it will be realised that the prevention of tuberculosis in swine is a subject well worth the attention of agriculturists.

The following table shows the percentage of the different classes of swine found to be affected.

Description.	Number of pigs found on premises.	Affected.	Percentage Affected.
Boars	82	20	19.6
Sows	913	150	14.1
Unweaned	1,395	47	3.2
Fattening	1,841	178	8.8
Stores	4,401	594	11.9

The 3.2 per cent. of unweaned pigs found infected probably received infection from their dams, and it is important to be able to state in this connection that the post-mortem reports on many infected sows contained references to the existence of mammary lesions.

It is also probable that some of the stores found affected received the infection from their dams, and were not noticed to be ill until they were weaned.

According to our present knowledge, the tuberculosis which affects pigs can be referred mainly to two types, bovine and avian, the former being the more common. This important question in relation to infection is now receiving attention at the Board's veterinary laboratory.

The fact that 11.9 per cent. stores were found affected, as compared with 3.2 per cent. unweaned pigs, however, rather supports the view that the infection in swine is mainly of bovine origin, and that it is acquired after weaning, for it is not until pigs are weaned that they become infected by feeding on tuberculous cow's milk, milk offals, and other offals of animal origin.

An important fact brought out by the table is that the higher percentage of infection was found in the older animals, that is to say, those which had been exposed longest to the risk of infection.

Tuberculosis, however, is, as a rule, a slowly progressive disease, and as the life of the majority of swine is a matter of months rather than years, a number, although infected in early life, will, if properly housed, and fed, fatten sufficiently to allow them to be marketed before symptoms of the disease are noticed by their owners. On the other

hand, breeding stock being allowed to live longer, the disease has more time to progress, and a greater proportion is found to be badly affected than among the shorter living classes of swine.

While it is generally held that tuberculosis of swine is primarily of bovine origin, infected sows, especially if their udders are affected, are a serious source of infection to their progeny.

Boars are usually housed separately from other pigs, but, if they are infected, they cannot be disregarded as sources of infection, for their dung is often thrown on to a dunghill to which the store pigs have access.

It may be concluded that a herd of swine in which about 10 per cent. are affected cannot be profitable. This point of view, unfortunately, is not fully brought home to those who breed stores for sale or to those who fatten them quickly for slaughter, because the loss frequently falls upon a middleman. The loss from a national point of view, however, is undeniable, and it ought not to be too much to expect pig breeders and feeders to act from this standpoint. Tuberculosis, its symptoms, and prevention are dealt with in Leaflet No. 277, and it is unnecessary to go into the matter here, except to repeat that tuberculosis of swine is preventable by measures which are within the power of every breeder and feeder to take.

PARTICULARS of the Board's scheme for the encouragement and improvement of the live stock breeding industry were given in this *Journal* for April, 1915, p. 46. The first Annual Report on the Report of the Board on the administration of the scheme during the twelve months, 1st April, 1914, to 31st March, 1915, has recently been published [Cd. 8017, price 3½d.].

Administration of the Grant for the Improvement of the Live Stock Breeding Industry. The total amount of financial assistance which the Board were authorised to give during the year was as follows:—

	£
Grants to societies or individuals for the provision of bulls	13,700
„ „ societies for the provision of boars	1,200
„ „ heavy horse societies	9,100
„ „ milk-recording societies	4,600
„ „ the selected agricultural institutions for the employment of live stock officers ..	8,400
	<u>£37,000</u>

The grant has been divided by the Board between England and Wales in proportion to the estimated numbers of holdings above 20 and not exceeding 100 acres—namely 81 and 19 per cent. to each country respectively—and they have apportioned the amount available between the twelve provinces into which the country has been divided for the purposes of agricultural education in accordance with the distribution of animals between these districts. The allocation of the amounts to each county was made on the same principle and in accordance with local needs.

The advisory work in connection with the scheme is carried out by the live stock committees of the advisory councils which have been set up in the above-mentioned provinces. In addition to these advisory bodies, a committee has been constituted in every county in which

the live stock scheme is in operation to assist the live stock officer (appointed in each province) to administer the grants. Many of the leading breeders and farmers of the country have been good enough to accept the invitation of the Board to serve on these committees, and their active co-operation and assistance should prove of great value.

The procedure as to the award of grants is briefly as follows: (1) The Board inform a provincial committee of the amount of grant available for their province; (2) the provincial committee allocate the amount between the counties within the province; (3) the county committee, in consultation with the live stock officer, recommend to the Board, for award of grants, those applications of which they approve; (4) the grants are made by the Board direct to the society or individual recommended.

Progress.—The live stock scheme may be considered to have been well received, and it has been well taken up in those districts in which live stock officers have been at work for some time in promoting it. Since its inception, 497 bulls and 115 boars have been located for service, grants have been made in respect of 72 stallions, and 16 milk-recording societies have been formed and have started operations.

Of the 497 bulls 454 were provided by societies and 43 by individuals; the average price paid was £36 (although some animals were purchased at notably higher figures), and the service fee varied from 5s. to 2s. 6d. In very many cases these animals have taken the place of mongrel sires, costing anything from £10 to £20. Only 83 of the 454 societies' bulls were purchased, the remaining 371 being provided by arrangement with the owners of the animals.

The average price paid for the 115 boars was £7, and, as in the case of bulls, these boars are reported to be taking the place of inferior sires. As a result of the condition that only pedigree boars are eligible for grants, steps were taken to establish a herd-book for "Gloucester Old Spots."

The 72 stallions were hired by 65 societies, 39 of which were new, and in all probability would not have come into existence had not the live stock scheme been started. The hiring fees averaged £231, with a service fee of £2 8s. 6d. The number of mares served averaged 90 per stallion, of which 68 were covered at the full fee and 22 at half fee.

With regard to the 16 milk-recording societies formed, the number of cows of which records are being taken is approximately 7,500. Considerable difficulty has been experienced in securing the support and interest of farmers in this part of the live stock scheme, but when the abnormal conditions that prevail are taken into account the results of the first year of operations may be regarded as being not altogether unsatisfactory.

In general, the live stock scheme has been taken up with more enthusiasm in some parts of the country than in others, but, it continued for a sufficient number of years, it must bring about a marked improvement of the live stock of those farmers and small-holders who take advantage of it.

Notwithstanding the difficulties that have arisen in some districts owing to local conditions or prejudices, the live-stock officers have been able to report that good work has been done on the whole, and that when the scheme becomes more widely known a more general adoption of it will be assured.

THE Annual Report of the Education Branch of the Board dealing with the distribution of grants for agricultural education and research in 1914-15 has been recently issued [Cd. 8066, price 8½d.]. During the year new regulations governing the distribution of grants for agricultural education and research were drafted (see this *Journal* for April, 1915, p. 65), and an account is given in the report under notice of the purposes for which they were introduced.

**Report of the
Education Branch,
1914-15.**

Full reports on the work of the Research Institutes established under the Board's Development Schemes are published, of which those relating to the Rothamsted Station, the Plant-breeding Institute at Cambridge, and the Fruit Research Institute at Bristol are of special interest.

The aggregate grants for Agricultural Education in the financial year 1914-15 were £95,410 as against £67,939 in the preceding year.

The report also gives an account of the war measures taken by the Education Branch since August of last year. On the outbreak of war a circular letter was addressed to the agricultural colleges in which it was pointed out that it was desirable that they should be prepared to advise on methods of economising crops then just harvested, and on possible alterations in the cropping of the succeeding season.

One of the first matters to attract attention was the need for augmenting the supply of home-grown foods. The steps taken to provide instruction on this subject by means of special leaflets have been noted from time to time in this *Journal*. Twenty-seven special war leaflets were issued during the year, and of these upwards of one million copies were distributed.

A grant of £60 was paid to Armstrong College in connection with the cultivation of allotment gardens in Cumberland and Westmorland by workers. Landowners agreed to provide land free of rent, and a committee, formed by prominent agriculturists, members of local authorities, manufacturers and others in the two counties, supplied seedling plants and technical advice through county instructors and the Armstrong College. The operations were highly successful, and resulted in a large increase in vegetable culture.

Another matter which pressed itself on attention early in the autumn of last year was the need for extending the important industries of fruit preserving and vegetable drying in this country. The latter industry was almost wholly in German hands before the war and, mainly in the case of potato drying, was indirectly aided by the State.

A scheme for the employment of women in fruit and vegetable preserving was set on foot by the Central Committee for Women's Employment and Dr. Lillias Hamilton, of Studley Horticultural College for Women, in order to provide employment for women thrown out of work by the war. As there seemed to be some prospect of developing a new local industry, the work was taken over by the Board and placed under the supervision of a representative Committee. A grant-in-aid of the work was made from the Development Fund.

For the purpose of financing these and similar schemes, a special emergency grant has been sanctioned by the Treasury from the Development Fund. The aggregate payments from this grant during the year were distributed as follows: Fruit and vegetable drying, £492; winter egg production, £71; home food culture committee

for Cumberland and Westmorland, £61; and enquiry into poultry industry in Wales, £45; total, £669.

Early in the present year the shortage of milkers all over the country suggested to the Board the advisability of instituting an experimental scheme for training women in milking. The agricultural colleges and established farm schools were, accordingly, approached with a suggestion that, if they would give facilities, the Board were prepared to provide a limited number of scholarships for the purpose. Many of these institutions accepted the scheme, and, with the aid of the Labour Exchange Department of the Board of Trade, a considerable number of women have been given short courses of instruction in milking and other suitable farm occupations. Numbers of these women have succeeded in obtaining employment, and the object of the Board—the demonstration of the possibility of training suitable women in a very short time for work of this kind—may be claimed to have been attained.

THE *Bulletin of Agricultural and Commercial Statistics* for September, 1915, issued by the International Institute of Agriculture, contains

Notes on Crop Prospects Abroad.

estimates of the production of cereal crops this year. The countries comprised in the approximate estimate of the production are as follows:—In *Europe*—Bulgaria, Denmark, Spain, France (not including the invaded regions), Great Britain, Ireland, Italy, Luxemburg, Netherlands, Rumania, Russia in Europe (54 governments), Switzerland; in *America*—Canada, United States; in *Asia*—India, Japan, Russia in Asia (10 governments in 1914-15 and 9 governments in 1913-14); in *Africa*—Egypt, Tunis.

Wheat.—The total production in the above-mentioned countries is estimated to amount to 431,956,000 qr. in 1914-15, against 362,558,000 qr. in 1913-14, or an increase of 19.1 per cent.

Rye.—In the specified countries, excluding Great Britain, India, Japan, Egypt, and Tunis, the estimated production is placed at 132,923,000 qr. this year, as compared with 115,256,000 qr. last year, the increase being equal to 15.3 per cent.

Barley.—For the above-mentioned countries, excluding Luxemburg and India, the total production is estimated at 138,793,000 qr. in 1914-15, against 118,350,000 qr. in 1913-14, or an increase of 17.3 per cent.

Oats.—For the same countries as above, excluding Luxemburg, India, Japan, and Egypt, the production is placed at 375,597,000 qr. this year, against 312,400,000 qr. last year, or an increase of 20.2 per cent.

Maize.—The production in Italy, Rumania, Russia in Europe (54 governments), Switzerland, United States, Japan, and Russia in Asia (10 governments in 1915, and 9 governments in 1914), is estimated at 383,995,000 qr. in 1915, or an increase of 10.8 per cent. compared with 1914, when the production amounted to 346,676,000 qr.

Live Stock in New Zealand.—The "Interim Return of Sheep in the Dominion on the 30th April, 1915," gives the number of sheep as 24,465,526, against 24,798,763 on the same date in 1914, or a decrease of 1.3 per cent. (*Bulletin of Agricultural and Commercial Statistics*, September, 1915.)

France.—The condition of the crops on the 1st September was officially estimated as follows:—Maize, 68 as compared with 74 on the 1st August; potatoes, 53 against 62; and linseed, 67 against 60. (80 = good, 60 = fairly good, and 50 = passable). (*The London Grain, Seed and Oil Reporter*, 27th September.)

According to the preliminary official estimates of the grain crops, the areas sown (exclusive of the territory occupied by the enemy) are as follows (acres): Wheat, 14,058,600; rye, 2,544,000; oats, 8,447,000; and barley, 1,711,000. The total production of wheat is estimated at 29,700,000 qr. as compared with 30,200,000 qr. for the whole country last year; rye, 4,550,000 qr. against 6,000,000 qr.; oats, 27,200,000 qr. against 36,000,000 qr.; and barley, 4,330,000 qr. against 5,800,000 qr. (*The London Grain, Seed and Oil Reporter*, 1st October.)

Holland.—H.B.M. Consul-General at Rotterdam in a report, dated 13th September, on the condition of the crops, stated that beans were, on the whole, good to very good, and peas were moderate to fairly good in the south of the country and in North Brabant and Gelderland, but good elsewhere. Mustard seed was good everywhere. Prospects for potatoes were rather unsatisfactory, and, on the whole, the yield will be less than last year. The condition of sugar-beet was fairly good to good, while onions were fairly good in North Holland, and good elsewhere. Chicory was fairly good to good generally.

Rumania.—The total production of the crops is officially estimated as follows:—Wheat, 13,600,000 qr., as compared with 5,800,000 qr. last year; maize, 12,800,000 qr., against 12,600,000 qr.; barley, 2,840,000 qr., against 12,800,000 qr.; oats, 2,750,000 qr., against 2,500,000 qr.; and rye, 360,000 qr., as compared with 210,000 qr. (*The London Grain, Seed and Oil Reporter*, 9th September.)

Russia.—According to the preliminary estimate published by the Central Statistical Committee, the area under the principal crops in 64 governments is as follows (acres):—Winter wheat, 17,150,400 as compared with 17,165,520 in 1914; spring wheat, 56,185,110 against 58,745,250; barley, 29,751,030 against 31,068,900; oats, 44,791,920 against 46,929,240; rye, 69,031,710 against 69,525,000; and potatoes, 8,792,550 against 9,562,860. The estimated total production in 61 governments is as follows (quarters):—Winter wheat, 31,950,000 as compared with 26,175,000 in 1914, and 26,280,000, the average of the years 1909-13; spring wheat, 71,745,000 against 66,892,000 and 63,927,000 respectively; barley, 56,835,000 against 47,619,000 and 15,588,000 respectively; oats, 100,184,000 against 91,332,000 and 101,947,000 respectively; maize, 8,722,000 against 9,135,000 and 8,205,000 respectively; and rye, 100,148,000 against 93,742,000 and 93,404,000 respectively. (*Broomhall's Corn Trade News*, 30th September.)

Canada.—According to a bulletin, dated 13th September, issued by the Census and Statistics Office at Ottawa, the total yield of wheat is estimated at 308,839,800 bush., as compared with 158,223,000 bush. last year; oats, 488,000,000 bush., against 311,426,000 bush.; barley, 51,655,000 bush., against 34,591,000 bush.; rye, 2,385,700 bush., against 2,258,000 bush.; and linseed, 12,199,600 bush., against 7,533,000 bush. (*The London Grain, Seed and Oil Reporter*, 18th September.)

United States.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture, in reporting as to crop conditions on the 1st October, states that the total production of winter wheat is estimated at 659,000,000 bush. as compared with a yield of

684,990,000 bush. last year; spring wheat at 345,000,000 bush. against 206,027,000 bush.; maize at 3,026,000,000 bush. against 2,672,804,000 bush.; oats at 1,517,000,000 bush. against 1,141,060,000 bush.; barley at 237,000,000 bush. against 194,953,000 bush.; and linseed at 18,000,000 bush. against 15,559,000 bush.—(*The London Grain, Seed and Oil Reporter*, 7th October.)

Australia.—The wheat crop of New South Wales is estimated by the Minister of Railways at 60,000,000 bush., as compared with 13,000,000 bush. last year, and 38,000,000 bush. in 1913. (*Broomhall's Corn Trade News*, 10th September.)

Hops.—*United States.*—His Majesty's Consul at Portland, Oregon, in a report, dated 31st August, stated that the hop crop in Oregon would not exceed 110,000 bales. Picking had begun, but many of the smaller yards, which had not been properly sprayed, were not fit to pick. According to a report, dated 27th August, prices were very low, being then only about 6d. per pound, and buyers were of opinion that the prices would be lower. About one-fourth of the hops had been sold.

THE reports furnished by the Crop Reporters of the Board on agricultural conditions in England and Wales, state that the weather of September, which was everywhere a very fine month, proved excellent for the completion of the harvest. The cereal crops were all secured in very good condition, though there is still some outstanding corn in the hilly districts. The dry weather arrested the progress of disease among the potatoes; and it is very frequently reported that the disease affected only the haulms without reaching the tubers. Most counties, however, mention its existence, although it appears to be little more prevalent than usual, except perhaps in Lancashire and some parts of the south-east of England. On the whole, the yield is expected to be about 1 per cent. below the normal.

Roots have been very generally kept back by the dry weather, accompanied in some districts by cold nights; while, owing to a certain scarcity of labour, hoeing has been frequently neglected. Turnips and swedes are consequently a poor crop, and unless good growing weather, with rain, should improve them, will probably be some 10 per cent. below average. Mangolds are better, but still they are expected, on the whole, to be some 4 per cent. below average.

A certain amount of autumn cultivation has been done, varying very much according to the locality. In many parts it is rather backward owing to the ground being too hard, and in other districts owing to the harvest having been rather late; on the whole, work is perhaps rather behindhand. In only very few instances is any wheat reported to have been sown by the end of September.

In the eastern counties roots and clovers grown for seed have very generally given poor results, especially the latter; and many farmers who had been intending to harvest clover seed have preferred to take a second crop of hay.

The young seeds are nearly everywhere healthy and vigorous, affording good prospects for next season; in only few cases are the fields patchy or otherwise unsatisfactory.

Pastures in some districts were getting rather bare at the end of the month, but generally there was plenty of keep. Live stock have done well generally.

ACCORDING to statements in the Board's *Monthly Agricultural Report* for 1st October, the supply of labour in England and Wales during September was everywhere more or

Agricultural Labour in England and Wales during September. less scarce, but the fine weather, by reducing the number of lost days, caused the deficiency to be less felt than would have been the case

with a wet harvest. In many cases women helped in the fields, and the chief trouble was noticed in connection with turnip hoeing. In some districts some apprehension was felt as to the sufficiency of labour for autumn cultivation.

The following local summaries give further details regarding agricultural labour in the different districts of England and Wales :—

Northumberland, Durham, Cumberland, and Westmorland.—Labour was still scarce, but the fine weather enabled the harvest to be secured in good time.

Lancashire and Cheshire.—Labour was scarce, but generally the shortage was not felt acutely, the favourable weather enabling the harvest to be terminated with a minimum of difficulty.

Yorkshire.—Labour continued to be scarce, but owing to the fine weather the shortage did not materially hamper the harvesting of the corn crops.

Shropshire and Stafford.—Labour was reported everywhere to have been scarce, especially casual labour. In south-east Stafford potato lifters were wanted during the month, and difficulty was experienced in procuring good stock and team men.

Derby Nottingham, Leicester, and Rutland.—In nearly all districts labour, both skilled and casual, was very short. Nottingham appeared to have felt the deficiency less than other counties. The excellent weather mitigated to some extent the inconvenience caused by the shortage.

Lincoln and Norfolk.—The supply of labour was generally deficient, especially for threshing; but, aided by the fine weather and mutual co-operation amongst farmers it proved just sufficient for harvest requirements. More serious difficulty, however, was anticipated in connection with autumn cultivation. In north-west Lincoln women were being extensively employed in lifting potatoes.

Suffolk, Cambridge, and Huntingdon.—Labour was still scarce, and women and boys were employed in many districts.

Bedford, Northampton, and Warwick.—Labour was generally scarce, the deficiency being most pronounced in Bedfordshire.

Buckingham, Oxford, and Berkshire.—The supply of labour was rather short, but, owing to the fine weather, the deficiency was not seriously felt.

Worcester, Hereford, and Gloucester.—There was a general and increasing shortage of labour, and in south-west Hereford threshing was said to have been much delayed thereby. In some districts more use was being made of female labour.

Cornwall, Devon, and Somerset.—Labour was very scarce, but no great inconvenience was felt except in parts of Somerset. The weather was favourable for the completion of harvesting operations without extra labour.

Dorset, Wiltshire, and Hampshire.—The supply of labour was still short, but the favourable weather enabled the harvest to be secured with less difficulty than was expected.

Surrey, Kent, and Sussex.—The supply of labour continued to be short, but no great inconvenience was caused.

Essex, Hertford, and Middlesex.—The supply of labour was generally short, and in the south of Essex the root crops were suffering for want of hoeing.

North Wales.—On the whole, labour was scarce, but the shortage would not appear to have been seriously felt. The supply of labour in Anglesey, in south-west Carnarvon, and in west Merioneth generally proved sufficient for the demand.

Mid Wales.—The supply of labour was short in some districts, but generally proved sufficient for immediate requirements, as the fine weather considerably facilitated the harvesting operations of the month.

South Wales.—Labour, especially casual labour, was still very short, but the deficiency was not felt so much since the harvest was secured.

**Prevalence of
Animal Diseases
on the Continent.**

The following statement shows that according to the information in the possession of the Board on 1st October, 1915, certain diseases of animals existed in the countries specified :—

Austria (on the 1st Sept.).

Foot-and-Mouth Disease, Glanders and Farcy, Swine Erysipelas, Swine Fever.

Denmark (month of July).

Anthrax, Foot-and-Mouth Disease (559 outbreaks), Swine Erysipelas, Swine Fever.

France (for the period 5th—18th Sept.).

Anthrax, Blackleg, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (for the period 15th—31st Aug.).

Foot-and-Mouth Disease, Glanders and Farcy, Swine Fever.

Holland (month of Aug.).

Anthrax, Foot-and-Mouth Disease (68 outbreaks), Foot-rot, Swine Erysipelas.

Hungary (on the 1st Sept.).

Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Italy (for the period 6th—12th Sept.).

Anthrax, Blackleg, Foot-and-Mouth Disease (2,455 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (month of Aug.).

Anthrax, Blackleg, Swine Fever.

Rumania (for the period 14th—21st Aug.).

Anthrax, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Russia (month of May).

Anthrax, Foot-and-Mouth Disease (272,019 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Spain (month of July).

Anthrax, Blackleg, Dourine, Glanders, Pleuro-pneumonia, Rabies,
Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (month of Aug.).

Anthrax, Blackleg, Swine Erysipelas.

Switzerland (for the period 13th—19th Sept.).

Anthrax, Blackleg, Foot-and-Mouth Disease (16 "étables"
entailing 655 animals, of which 2 "étables" were declared infected
during the period), Swine Fever.

No further returns have been received in respect of the following
countries:—Belgium, Bulgaria, Montenegro, Serbia.

The Weather in England during September.

District.	Temperature.			Rainfall.			Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.	Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.	
<i>Week ending Sep. 4th :</i>	°F.	°F.	In.	Mm.*	Mm.*	Hours.	Hours	
England, N.E.	51·6	—5·1	0·81	21	+ 5	5	5·7	+1·0
England, E.	53·2	—5·3	0·60	15	+ 1	5	4·4	—1·1
Midland Counties ...	52·4	—5·0	0·31	8	— 8	3	5·0	+0·2
England, S.E.	54·5	—5·1	0·75	19	+ 2	4	4·8	—0·9
England, N.W.	51·9	—5·1	0·69	17	— 6	3	6·5	+2·0
England, S.W.	53·8	—4·3	0·47	12	—11	4	6·0	+0·6
English Channel ...	56·4	—4·3	1·08	27	+10	4	7·2	+0·7
<i>Week ending Sep. 11th :</i>								
England, N.E.	57·2	+1·3	0·02	1	—14	1	7·8	+3·0
England, E.	57·9	+0·2	0·01	0	—12	1	9·1	+3·7
Midland Counties ...	56·7	+0·2	0·00	0	—13	0	8·5	+3·8
England, S.E.	57·1	—1·7	0·00	0	—14	0	10·2	+4·6
England, N.W.	58·3	+2·0	0·07	2	—16	1	7·8	+3·2
England, S.W.	57·0	—0·5	0·00	0	—18	0	9·3	+4·0
English Channel ...	60·6	+0·5	0·00	0	—14	0	10·8	+4·3
<i>Week ending Sep. 18th :</i>								
England, N.E.	59·3	+4·3	0·09	2	—10	1	4·7	0·0
England, E.	61·6	+4·8	0·04	1	— 9	1	5·3	+0·1
Midland Counties ...	60·5	+4·8	0·08	2	— 8	2	4·5	—0·1
England, S.E.	61·9	+3·9	0·11	3	— 8	2	5·9	+0·5
England, N.W.	59·8	+4·1	0·08	2	—12	2	4·7	+0·1
England, S.W.	60·5	+3·6	0·34	9	— 5	4	4·7	—0·4
English Channel ...	63·1	+3·5	0·16	4	— 8	2	6·2	—0·4
<i>Week ending Sep. 25th :</i>								
England, N.E.	56·5	+2·6	0·44	11	+ 2	2	3·8	—0·6
England, E.	58·8	+3·2	0·22	6	— 5	2	5·5	+0·0
Midland Counties ...	56·8	+2·4	0·62	16	+ 5	2	4·6	—0·3
England, S.E.	59·7	+2·9	0·82	21	+ 9	2	5·6	+0·0
England, N.W.	58·0	+3·1	0·39	10	— 7	3	4·6	+0·4
England, S.W.	58·9	+3·0	0·38	10	— 8	4	4·5	—0·2
English Channel ...	62·0	+3·2	0·84	21	+ 6	2	5·5	—0·6

* 1 inch = 25·4 millimetres.

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked
or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	SEPTEMBER.		NINE MONTHS ENDED SEPTEMBER.	
	1915.	1914.	1915.	1914.
Anthrax:—				
Outbreaks	24	39	442	557
Animals attacked	25	48	503	612
Foot-and-Mouth Disease:—				
Outbreaks	—	8	—	22
Animals attacked	—	17	—	108
Glanders (including Farcy):—				
Outbreaks	—	8	36	81
Animals attacked	1	39	66	249
Parasitic Mange:—				
Outbreaks	48	9	*628	1,530
Animals attacked	94	9	*1,354	2,642
Sheep-Scab:—				
Outbreaks	3	2	164	155
Swine Fever:—				
Outbreaks	170	336	3,163	3,157
Swine Slaughtered as diseased or exposed to infection ...	578	2,129	13,920	31,068

* Figures for six months only, the Parasitic Mange Order of 1911 having been suspended from 6th August, 1914, to 27th March, 1915, inclusive.

IRELAND.

(From the Returns of the Department of Agriculture and
Technical Instruction for Ireland.)

DISEASE.	SEPTEMBER.		NINE MONTHS ENDED SEPTEMBER.	
	1915.	1914.	1915.	1914.
Anthrax:—				
Outbreaks	—	—	1	1
Animals attacked	—	—	1	1
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	76
Animals attacked	—	—	—	957
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	3	—
Parasitic Mange:—				
Outbreaks	5	5	58	67
Sheep-Scab:—				
Outbreaks	25	17	315	407
Swine Fever:—				
Outbreaks	18	3	193	161
Swine Slaughtered as diseased or exposed to infection ...	100	23	1,100	842

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES
in September and August, 1915.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	SEPTEMBER.		AUGUST.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	12 4	11 4	13 4	12 3
Herefords	12 8	11 7	13 2	12 0
Shorthorns	12 7	11 6	13 3	12 2
Devons	12 9	11 9	13 4	12 5
Welsh Runts	12 5	11 9	13 3	12 7
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	10½	9½	10½	9½
Sheep:—				
Downs	11	10	11	10½
Longwools	10½	9½	10½	9½
Cheviots	11½	10½	11	10
Blackfaced	10½	9½	10½	9½
Welsh	10	9½	10½	9½
Cross-breeds	11	10	11	10
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs:—				
Bacon Pigs	10 4	9 9	9 9	9 3
Porkers	10 9	10 3	10 2	9 9
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	27 5	22 10	26 17	22 2
„ —Calvers	25 13	21 7	25 7	21 5
Other Breeds—In Milk ...	25 3	19 16	24 4	19 17
„ —Calvers	20 0	18 10	19 5	17 17
Calves for Rearing	3 3	2 7	3 3	2 8
Store Cattle:—				
Shorthorns—Yearlings ...	13 17	11 17	13 17	11 15
„ —Two-year-olds... ..	20 6	17 10	19 6	16 19
„ —Three-year-olds ...	25 17	22 6	25 18	22 5
Herefords —Two-year-olds...	21 6	18 7	21 19	18 15
Devons— „	20 2	17 4	19 16	17 12
Welsh Runts— „	20 14	19 6	19 10	17 15
Store Sheep:—				
Hoggs, Hoggets, Togs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	46 3	39 4	45 5	39 2
Store Pigs:—				
8 to 12 weeks old	28 11	23 3	28 1	22 2
12 to 16 weeks old	46 0	35 3	44 0	33 11

* Estimated carcass weight.

**AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND in September, 1915.**

*(Compiled from Reports received from the Board's Market
Reporters.)*

Description.	Quality.	Birming- ham.	Leeds.	Liver- pool.	Lon- don.	Man- chester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
BEEF:—		<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
English	1st	84 0	80 6	—	84 6	81 6
	2nd	81 0	78 6	—	79 0	77 0
Cow and Bull	1st	77 0	75 0	73 6	74 0	73 6
	2nd	72 0	69 6	67 0	69 6	69 0
Irish: Port Killed	1st	83 0	79 6	81 6	82 0	79 6
	2nd	81 0	76 0	75 6	76 6	74 6
Argentine Frozen—						
Hind Quarters	1st	75 0	—	75 6	72 6	77 0
Fore „	1st	65 0	—	66 0	63 0	69 0
Argentine Chilled—						
Hind Quarters	1st	73 6	73 0	73 0	72 6	72 6
Fore „	1st	58 6	58 0	57 6	56 0	57 6
Australian Frozen—						
Hind Quarters	1st	73 6	74 6	73 0	71 0	73 6
Fore „	1st	64 0	69 0	66 6	64 0	66 6
VEAL:—						
British	1st	87 6	82 0	84 0	94 6	79 0
	2nd	80 6	77 6	74 0	85 0	72 0
Foreign	1st	—	—	—	—	—
MUTTON:—						
Scotch	1st	—	—	—	96 6	95 6
	2nd	—	—	—	91 6	91 6
English	1st	88 6	91 0	84 0	90 6	90 6
	2nd	82 0	86 6	74 6	84 6	86 0
Irish: Port Killed	1st	86 6	—	82 6	87 0	88 6
	2nd	84 0	—	75 6	82 0	82 6
Argentine Frozen	1st	61 6	61 6	60 0	64 6	60 0
Australian „	1st	58 0	59 6	57 6	59 6	57 6
New Zealand „	1st	59 6	—	—	69 0	—
LAMB:—						
British	1st	90 6	92 0	92 0	98 0	95 6
	2nd	87 6	87 0	82 6	90 0	91 0
New Zealand	1st	81 6	81 0	77 0	77 6	77 0
Australian	1st	74 6	70 0	72 6	73 6	72 6
Argentine	1st	74 0	69 6	73 0	72 0	73 6
PORK:—						
British	1st	91 6	86 0	88 6	97 6	87 0
	2nd	87 6	80 6	83 0	88 6	80 6
Foreign	1st	—	—	—	—	—

**AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at
certain MARKETS in ENGLAND in September, 1915.**

*(Compiled from Reports received from the Board's Market
Reporters.)*

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER:—						
British... ..	s. d. per 12 lb. 18 3	s. d. per 12 lb. 16 6	s. d. per 12 lb. —	s. d. per 12 lb. —	s. d. per 12 lb. 17 6	s. d. per 12 lb. 16 6
Irish Creamery—Fresh	per cwt. 166 0	per cwt. 161 0	per cwt. 165 0	per cwt. 162 0	per cwt. 166 6	per cwt. 161 0
„ Factory	142 0	135 6	141 6	136 0	149 0	139 0
Danish... ..	—	—	178 6	176 0	178 0	175 0
French... ..	—	—	—	—	152 0	146 0
Russian	143 0	135 0	138 6	136 0	139 6	133 6
Australian	—	—	—	—	—	—
New Zealand	—	—	—	—	—	—
Argentine	—	—	—	—	156 0	152 0
CHEESE:—						
British—						
Cheddar	89 0	77 0	93 0	89 6	91 0	84 6
Cheshire	—	—	120 lb. 86 6	120 lb. 82 0	120 lb. 89 0	120 lb. 81 6
Canadian	79 0	75 0	per cwt. 79 6	per cwt. 75 0	per cwt. 77 0	per cwt. 74 0
BACON:—						
Irish (Green)	109 6	105 0	106 6	102 6	105 0	102 0
Canadian (Green sides)	96 0	83 6	94 6	85 0	95 0	90 0
HAMS:—						
York (Dried or Smoked)	122 0	118 0	—	—	125 6	120 0
Irish (Dried or Smoked)	—	—	—	—	124 6	118 6
American (Green) (long cut)	74 0	71 0	75 0	71 0	75 0	71 0
EGGS:—						
British... ..	per 120. 17 11	per 120. 16 3	per 120. —	per 120. —	per 120. 19 7	per 120. 18 1
Irish	17 6	17 2	17 2	16 1	18 4	17 10
Danish... ..	—	—	—	—	19 8	17 8
POTATOES:—						
British Queen	per ton. 85 0	per ton. 75 0	per ton. 73 6	per ton. 66 6	per ton. 83 0	per ton. 75 0
Edward VII.	88 6	81 0	71 6	63 6	81 6	73 0
Up-to-date	81 0	75 0	68 6	61 6	79 0	71 0
HAY:—						
Clover	—	—	168 0	136 0	128 0	117 0
Meadow	—	—	—	—	117 6	108 6

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1913, 1914 and 1915.

Weeks ended (in 1915).	WHEAT.						BARLEY.						OATS.					
	1913.		1914.		1915.		1913.		1914.		1915.		1913.		1914.		1915.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 2...	30	5	31	1	44	4	28	6	26	2	29	10	19	10	18	2	26	6
" 9...	30	3	30	11	46	2	28	4	25	11	29	7	19	2	18	4	26	5
" 16...	30	5	31	0	48	9	28	6	26	0	30	5	19	4	18	6	27	6
" 23...	30	11	30	11	51	6	28	10	26	3	31	3	19	4	18	11	28	10
" 30...	31	1	31	1	52	8	28	11	26	6	32	5	20	2	19	1	29	10
Feb. 6...	31	0	31	0	53	3	28	10	26	7	33	7	20	1	18	9	30	3
" 13...	30	9	31	0	54	8	29	1	26	7	34	7	20	2	18	11	31	1
" 20...	30	11	31	0	56	0	28	8	26	7	34	11	20	7	18	11	31	5
" 27...	31	0	31	0	56	0	28	6	26	6	35	3	20	4	18	11	31	8
Mar. 6...	31	3	31	5	55	11	28	5	26	2	34	6	20	0	18	9	31	8
" 13...	31	1	31	6	54	8	27	11	26	0	33	5	20	2	18	7	31	0
" 20...	31	1	31	5	53	9	28	6	25	8	32	2	19	11	18	6	30	7
" 27...	31	3	31	4	54	3	27	6	25	7	31	11	19	7	18	8	30	6
Apl. 3...	31	4	31	6	54	6	27	0	25	6	31	9	19	2	18	5	30	6
" 10...	31	3	31	5	54	9	27	8	26	8	31	3	19	2	18	4	30	4
" 17...	31	6	31	7	55	4	26	11	25	4	30	10	18	10	18	4	30	5
" 24...	31	8	31	9	56	5	26	7	26	6	31	5	19	3	18	5	30	11
May 1...	32	2	31	9	58	3	25	11	26	0	32	7	19	6	18	5	31	5
" 8...	32	6	32	2	60	5	25	9	25	6	33	3	19	6	18	9	32	4
" 15...	32	10	32	7	61	7	25	4	26	3	34	0	19	9	18	11	32	5
" 22...	32	10	33	0	62	0	25	3	25	10	34	1	19	11	19	0	32	8
" 29...	32	7	33	9	61	11	26	1	26	1	34	8	20	1	19	4	32	7
June 5...	32	10	34	0	61	9	26	2	25	11	35	4	19	8	19	4	32	5
" 12...	32	8	34	1	60	1	24	7	24	11	31	5	20	2	19	8	32	4
" 19...	32	8	34	1	56	1	23	10	25	10	34	3	19	8	19	9	31	9
" 26...	32	8	34	3	52	0	24	3	25	4	34	4	19	1	20	0	31	9
July 3...	33	1	34	4	49	5	25	2	24	6	35	3	21	0	19	9	31	1
" 10...	33	4	34	2	50	1	25	10	24	9	34	7	19	4	20	0	31	6
" 17...	33	6	34	1	52	7	24	9	24	2	35	8	20	5	19	10	31	6
" 24...	33	10	34	0	53	10	24	1	24	7	35	10	20	8	19	9	32	1
" 31...	34	1	34	2	55	3	24	5	25	9	36	1	20	3	19	8	31	1
Aug. 7...	34	1	34	9	55	4	24	9	25	2	35	7	19	0	19	1	31	5
" 14...	34	3	40	3	55	2	24	7	29	4	37	0	18	7	25	1	31	7
" 21...	33	7	38	9	54	3	26	5	29	10	39	4	18	8	24	3	31	4
" 28...	32	7	36	2	51	11	29	0	30	3	38	3	17	10	23	5	30	0
Sept. 4...	31	11	36	5	45	3	30	11	30	6	38	1	17	8	23	9	26	10
" 11...	31	9	37	10	43	0	31	5	29	11	37	11	18	0	23	11	26	8
" 18...	31	7	38	3	42	9	30	9	29	5	39	0	17	11	23	8	26	4
" 25...	31	6	37	6	43	3	30	1	29	3	39	8	17	9	23	3	26	1
Oct. 2...	31	3	37	1	43	5	29	9	29	1	40	4	17	10	22	9	26	5
" 9...	31	0	36	8			29	1	28	10			17	10	22	5		
" 16...	30	11	36	7			28	8	28	8			17	9	22	4		
" 23...	30	7	37	2			28	7	28	7			18	0	22	5		
" 30...	30	1	37	10			28	2	28	3			17	9	23	7		
Nov. 6...	30	0	38	8			28	1	28	6			17	9	23	7		
" 13...	30	1	39	8			27	8	29	0			17	11	24	8		
" 20...	30	4	41	0			27	5	29	8			18	1	25	5		
" 27...	30	9	41	11			27	0	30	3			18	4	25	8		
Dec. 4...	31	2	42	2			26	8	30	2			18	4	25	9		
" 11...	31	2	42	1			26	5	29	11			18	6	25	9		
" 18...	31	2	42	7			25	11	29	8			18	5	25	9		
" 25...	31	0	43	3			25	10	29	9			18	4	25	11		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of September, 1914 and 1915.

	WHEAT.		BARLEY.		OATS.	
	1914.	1915.	1914.	1915.	1914.	1915.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	39 2	44 4	30 0	40 4	25 0	27 9
Norwich ...	37 3	44 1	29 4	38 4	23 10	25 10
Peterborough ...	37 0	41 11	28 9	38 6	23 6	26 0
Lincoln ...	37 5	44 1	29 3	38 8	23 3	26 9
Doncaster ...	36 6	44 2	27 2	36 10	23 1	27 7
Salisbury ...	37 6	43 11	29 7	38 8	23 8	27 0

ADDITIONS TO THE LIBRARY.

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- Imperial Institute.*—The World's Supply of Potash. (47 pp.) London : Imperial Institute, 1915. 1s. post free. [63.1673.]
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- Dayliss, W. M.*—The Nature of Enzyme Action. (180 pp.) London : Longmans, Green & Co., 1914. [54(02).]
- Georgia, A. E.*—A Manual of Weeds. (593 pp.) New York : The MacMillan Co., 1914. 8s. 6d. net. [63.259(02).]
- Kuczyński, R., und Zuntz, N.*—Unsere bisherige und unsere künftige Ernährung im Kriege. (85 pp.) Braunschweig : F. Vieweg & Sohn, 1915. [63(13).]
- U.S. Department of Agriculture, Office of the Secretary.*—Report 100 :—Potash from Kelp. (122 pp. + XL. plates.) Washington, 1915. [63.1673.]
- Missouri Agricultural Experiment Station.*—Research Bull. 15 :—An Experimental Study of the Rest Period in Plants. The Summer Rest of Bulbs and Herbaceous Perennials. (25 pp.) Research Bull. 16 :—An Experimental Study of the Rest Period in Plants. Pot-Grown Woody Plants. (27 pp.) Columbia, Miss., 1915. [58(04).]

Field Crops—

- Lamborn, L. L.*—Cotton Seed Products. (240 pp.) New York : D. Van Nostrand Company. London : Archibald Constable & Co., 1904. [63.34113; 63.604(4).]
- U.S. Department of Agriculture.*—Bull. 238 :—Sugar Beets : Preventable Losses in Culture. (21 pp.) Washington, 1915. [63.3432.]

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- Logan, A.*—First Book of School Gardening. (151 pp.) London : MacMillan & Co., 1915. 1s. 6d. [63.5(07).]
- Lloyd, J. W.*—Productive Vegetable Growing. (339 pp.) Philadelphia and London : J. B. Lippincott Company, 1914. \$1.50 net. [63.51(02).]
- Sears, F. C.*—Productive Orcharding. (315 pp.) Philadelphia and London : J. B. Lippincott Company, 1914. \$1.50 net. [63.41(02).]

